Heating and Ventilating

For Engineers and Contractors Controlling the Design, Specification, Installation and Maintenance of Heating, Ventilating and Air Conditioning

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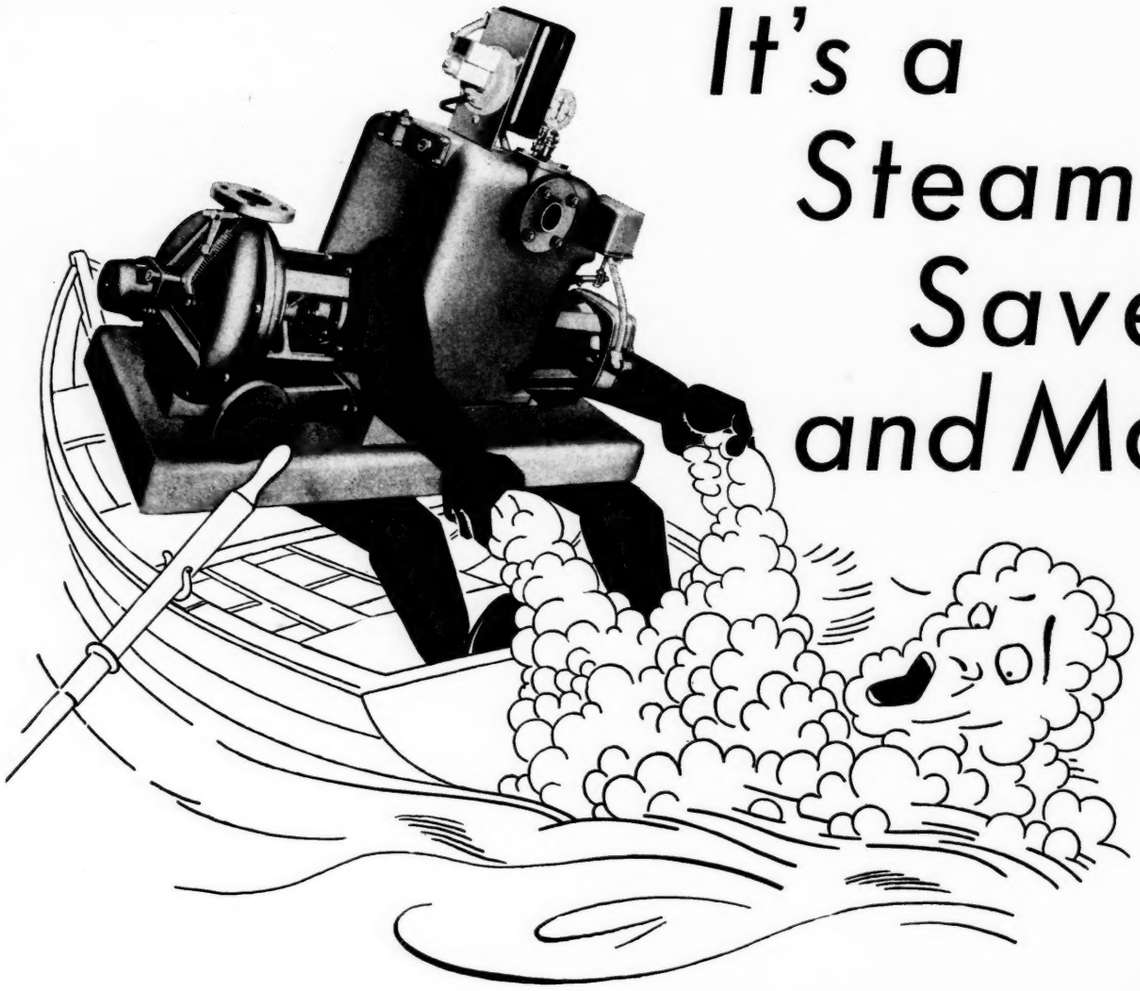

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But here is a remarkable feature of this pump. It actually saves steam as compared with electrically driven pumps of the same capacity. Users report a marked decrease in fuel consumption. Why? Because the Vapor Turbine operates continuously. This means constant removal of air and condensate, i. e., the maintenance of uniform conditions in the return line. And uniform circulation means steam saving.

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THE NASH ENGINEERING COMPANY

SOUTH NORWALK, CONNECTICUT, U. S. A.

HEATING AND VENTILATING Announces Its Index of Heating Business Activity

By CLIFFORD STROCK†

IT is with considerable pleasure that HEATING AND VENTILATING announces its Index of Heating Business Activity which, for the first time, makes available to business men in the industry a scientifically constructed single measure or gauge of business in their field.

The index was originally planned two years ago, and during these two years a number of methods of constructing the index were investigated, tried and discarded. After the building of the index was finally under way, several thousand calculations were necessary in the various steps of determining the seasonal variation of each of the component series of the index, correcting the actual data for this variation, weighting the series, and finally, in combining them into the single index.

During pre-depression days such an index was not needed, for it was generally agreed that activity in the heating industry was directly proportional to the volume of new building construction. This relationship is no longer true to the extent it was in 1929, and new building is not currently an accurate gauge of heating business. The index now makes it possible to measure the amount of this divergence.

†Associate Editor, HEATING AND VENTILATING.

What the Index Shows

The index, shown in graph form in Fig. 1, indicates the fluctuations, since 1929, of the combined activity of various branches of the heating industry *adjusted for seasonal variation.* That is, the usual seasonal peaks and valleys have been ironed out, so that when the index moves upward we know that it is an actual increase in business and not simply a usual seasonal flurry. In the heating industry the peak is usually reached in October, and for several months preceding this peak each month shows an increase over the one before. These increases from month to month, and also the decreases from month to month following the peak have been measured, and allowances made for them in the index. If the percentage increase in business during the fall months is less than usual, the index will drop, even although the actual figures are increas-

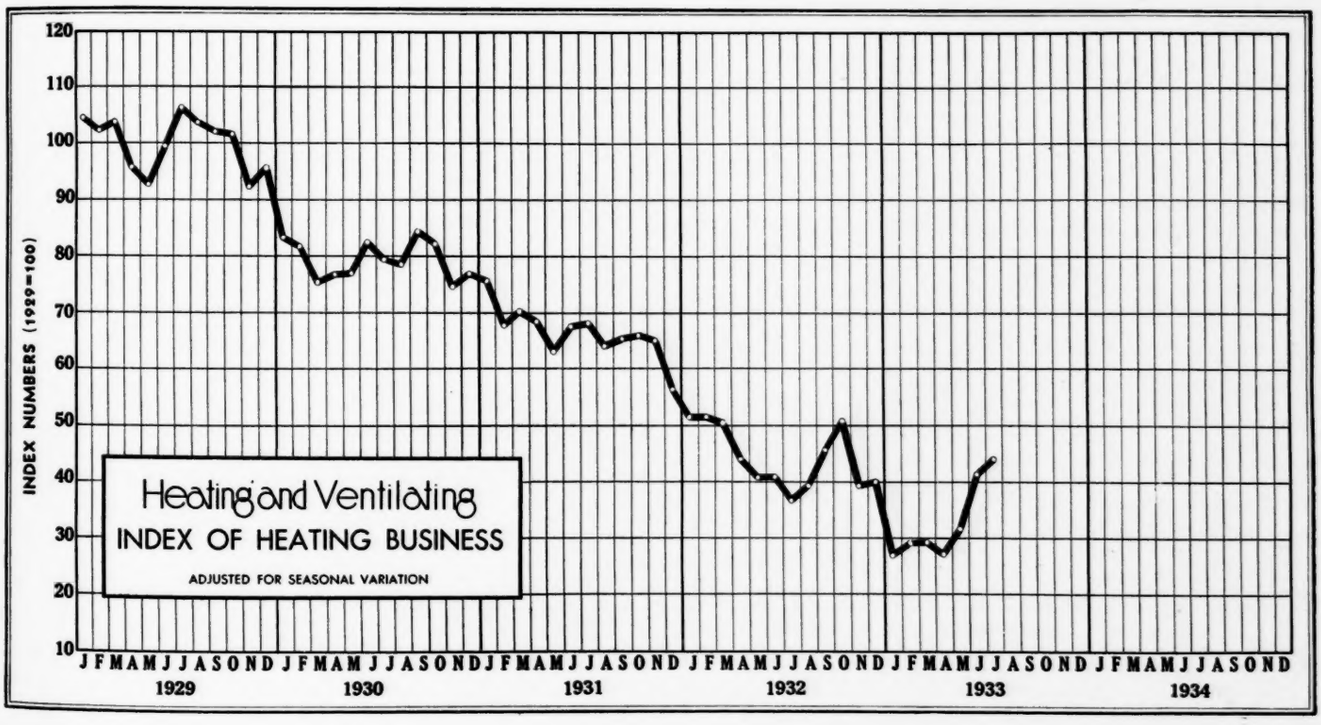

INDEX NUMBERS (1929=100)
120
110
100
90
80
70
60
50
40
30
20
10
Heating and Ventilating
INDEX OF HEATING BUSINESS
ADJUSTED FOR SEASONAL VARIATION
J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D
1929
1930
1931
1932
1933
1934

Fig. 1. HEATING AND VENTILATING'S new Index of Heating Business Activity. Fluctuations of this curve are entirely independent of seasonal increases and decreases. The index numbers from which the curve was plotted are presented on page 8.

ing. Similarly, during the winter when the industry goes into a seasonal decline, if the loss is less in percentage than usual, the index will rise. If the increase or decrease in business is less than the usual seasonal increase or decrease, the index drops. If business follows the usual seasonal trend exactly, then the index remains constant.

Consequently, when using the index, we can forget about the season. We need not refer back to preceding years to see what happened in past years. We need not go to any trouble calculating past increases or drops. Moreover, use of the index prevents us from being overly pleased with what is just a seasonal rise, or depressed by what is simply a normal seasonal drop.

The index number for any given month is in terms of the 1929 average. That is, by calling the average of the 12 months of that year 100, the business of each month is expressed as a percentage of that average.

Although the reason for using 1929 instead of some other year as the base was largely a technical one, this base has some advantages. One is that almost all our ideas of business look back to the last year before the depression—1929. Another is that there is a considerable amount of statistical information on business activity of contractors in that year from the Census of the Construction, on manufacturers in the 1929 Biennial Census of Manufactures, and for wholesalers and retailers from the Census of Distribution. The index can be applied against those data to arrive at conclusions regarding what the probable figures are for current years.

Fig. 2 shows graphically the trend of business activity in the heating field compared with new building construction. This illustrates not only a use of the index, but shows plainly the deviation of the heating business curve from that of building construction. The ratio between new building and heating business has changed markedly since 1929. Our industry is deriving business from some form of activity or activities other than construction. Although in straightened circumstances, this industry is still better off than those completely tied up with new building.

On the other hand, heating has fallen off more sharply than general business. (See Fig. 3). This is to be expected. The basic industries—such as food, garment-making, etc.—aid in maintaining the relatively better standing of general business.

We have said that the index shows the trends of the heating industry as a whole. It does some-

Index of Heating Business Activity

(1929 average = 100)

1929	
January	104.4
February	102.4
March	103.8
April	95.9
May	92.8
June	99.6
July	106.3
August	103.7
September	102.1
October	101.6
November	92.2
December	95.7
1930	
January	83.3
February	81.9
March	75.3
April	76.9
May	77.1
June	82.5
July	79.6
August	78.7
September	80.8
October	82.1
November	74.8
December	77.0
1931	
January	75.7
February	67.7
March	70.2
April	68.4
May	63.0
June	67.6
July	68.0
August	64.0
September	65.2
October	65.9
November	65.0
December	56.3
1932	
January	51.7
February	51.6
March	50.6
April	44.0
May	40.8
June	41.0
July	36.8
August	39.4
September	45.9
October	50.9
November	39.5
December	40.0
1933	
January	27.0
February	29.1
March	29.2
April	27.2
May	31.9
June	41.6
July	44.1

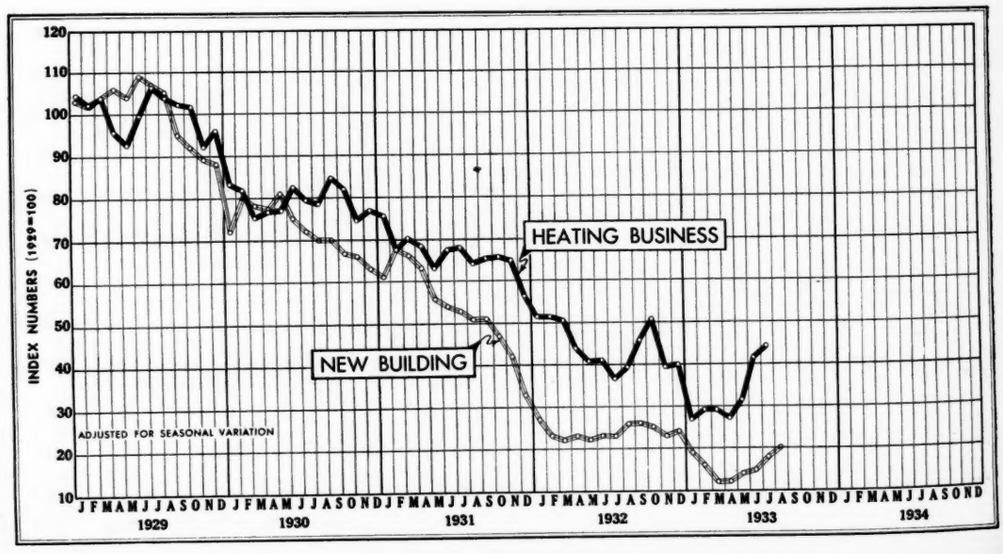

INDEX NUMBERS (1929=100)
120
110
100
90
80
70
60
50
40
30
20
10
HEATING BUSINESS
NEW BUILDING
ADJUSTED FOR SEASONAL VARIATION
J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D
1929
1930
1931
1932
1933
1934

Fig. 2. Seasonally adjusted indexes for Heating Business compared with those for New Building

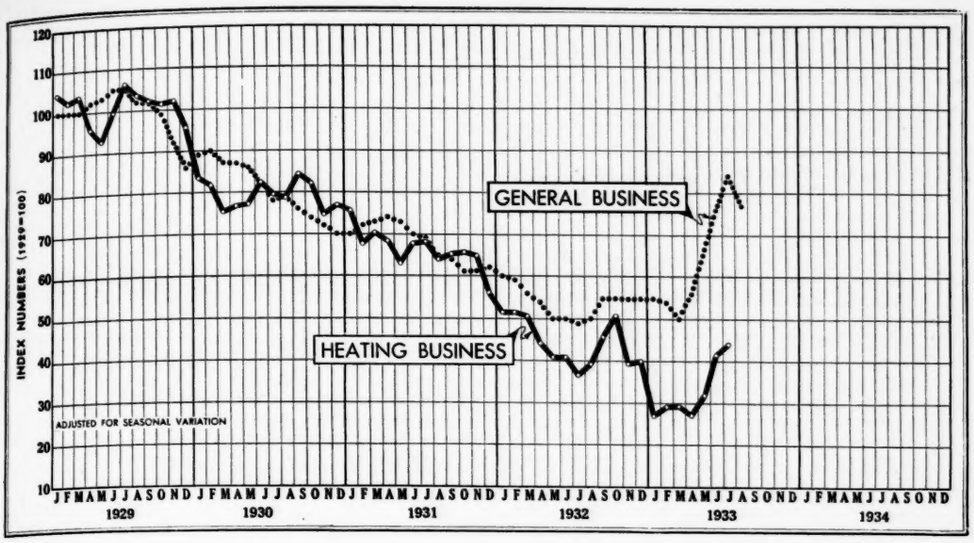

INDEX NUMBERS (1929=100)
120
110
100
90
80
70
60
50
40
30
20
10
GENERAL BUSINESS
HEATING BUSINESS
ADJUSTED FOR SEASONAL VARIATION
J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D
1929
1930
1931
1932
1933
1934

Fig. 3. Seasonally adjusted indexes for Heating Business compared with those for General Business

what more. It indicates the trends of the more important groups that make up the industry.

This is the case because the index is based on data supplied by manufacturers on the quantity of goods shipped each month. The goods shipped each month measures the business done by the manufacturer,[1] and consequently, the index directly reflects the trend of his business. It is well recognized that in this industry, generally speaking, the quantity of materials used on the job by the contractor is proportional to the volume of work he is handling. It is quite common, for example, for the contractor to estimate labor and overhead on the basis of the value of materials. This being so, the relative activity of the manufacturer in shipping goods, and consequently our index, indicates degree of activity on the part of the installer. Roughly speaking, this is also true of the wholesaler. Goods being ordered from the manufacturer also reflects activity of the sales engineers, contractors' engineers, manufacturers' agents, and similar groups immediately concerned with a given installation. However, the index lags behind the work of the consulting engineer, in that his plans may be completed many months before materials are ordered for the job.

What the Index Includes

It is not necessary here to describe in detail the statistical technique used in constructing the Heating Index. Properly to understand the index, however, it is advisable to explain just what the index includes and what it does not.

Although there are data available each month on sales of about 18 different types of heating and ventilating materials, not all of these lend themselves for use in an index, for either or both of the following reasons:

1—For some equipment the data do not extend back over a sufficient number of years.

2—Many series are reported in dollars, and not in physical units. Since the value of the dollar has fluctuated so sharply during the last few years, it was not advisable to include these until some later date, after data on price fluctuations of these equipments have been determined.

[1]Activity of the manufacturing plant at a given time may be, and usually is, quite different from the manufacturer's sales. We are here referring to the activity of the manufacturer as a seller, and not as a fabricator, of goods.

The series which were available for a sufficient number of years, by months, and which were reported in physical units, such as weight, square feet, B.t.u. capacity, or number of units, which consequently were included are:

Cast-iron radiators
Oil burners
Steel heating boilers
Round cast-iron boilers
Square cast-iron boilers
Gas boilers.

The final index reflects the combined activity in all of these series, each being weighted according to its relative importance in the completed picture.

Inclusion of these series had some obvious advantages. Failure to include others resulted in some weaknesses. It is hoped that readers will make use of the index, and this being the case they should be acquainted with its weak points as well as its desirable features.

Disadvantages—Monthly data on warm-air furnaces are not available, and therefore not included. The result is that the index does not reflect activity of an important group—manufacturers, jobbers, and installers of furnaces.[2]

Other important equipments not now covered by the index include fans and blowers, indirect heating surface, and air conditioning equipment. Therefore, the index in no sense covers *ventilating activity*. It is strictly a *heating* index.

The "raw" data from which the index is developed are those published by the Department of Commerce. The lag between the close of each month and the receiving of the data by the Department, the loss in time till available from the Department, and the lag between their availability and the publication of this magazine, all result in the index being several months behind the current month. This is a serious disadvantage.

Since detailed explanations of possible uses of the index cannot be discussed here, HEATING AND VENTILATING invites correspondence with those who wish to make further use of the index in applying it against data from their own businesses.

Special acknowledgment is made of the efforts of W. R. Cowie, of Columbia University, without whose encouragement and advice regarding statistical technique the almost monumental task of constructing the index would not have been possible.

[2]That is, coal-fired furnaces. Gas furnaces are included under gas boilers.

Five NRA Codes Approved, Eleven Hearings Held, Remainder on File

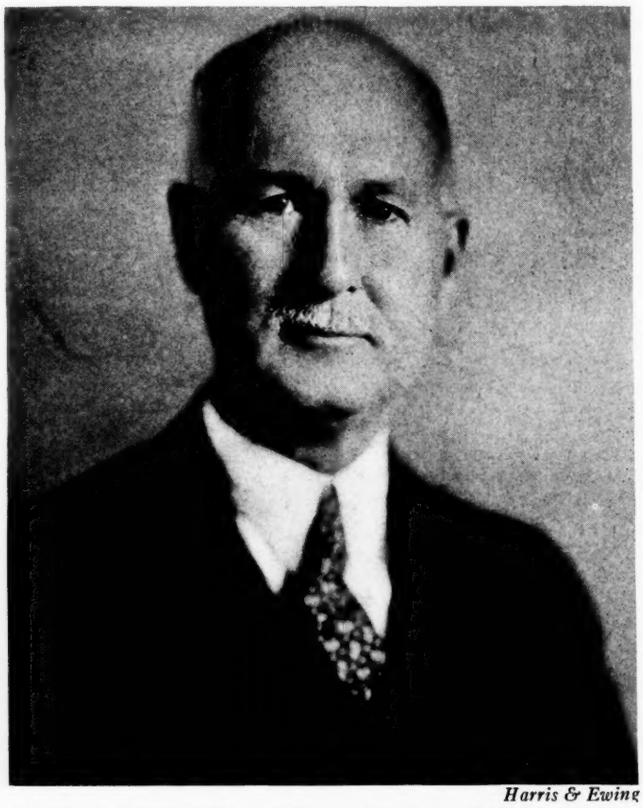
Oil Burner, ice, sprinkler, and steel boiler codes have received presidential approval. Manufacturing codes may be correlated for whole industry. Status of Construction League code.

PUBLIC hearings have held the attention of NRA during the past month. This was entirely in accordance with what was to be expected, for the preparation and filing stage ebbed in August. In September the hearings really got going, while during October they have developed into the order of the day. At the end of the month there was still plenty of grist for the mill which is still grinding steadily.

While many codes have passed through the hearing stage and have disappeared from view into the Washington offices but few as yet have reappeared bearing the stamp of the Administrator for submission to the President. Consequently, but few have so far received formal presidential approval.

Some months ago we started watching the preparation of those codes of direct interest and counted approximately 20. A check on these shows that five have now received presidential approval; 11 more have had public hearings and are in process in the NRA offices; while the remainder are still on file without indication as to what action will be taken regarding them. Thus, with approximately three-fourths of the codes past the hearing stage it is to be expected that this phase will be completed within the next 30 days. During the same period many of the codes which have now passed through hearings should receive presidential approval. In fact, it is a reasonable expectation that practically all of the codes should receive approval before the end of the vear.

Of the five codes already approved, only one —the manufacture of steel boilers—is a strictly manufacturing code. It is not concerned with the regulation of distribution of the product. The others are vertical in form, and cover not only the manufacture but the distribution of the product as well. Among these are the oil-burner, the ice industry, and the automatic sprinkler.



Harris & Ewing

Alonzo J. Hammond, president, American Society of Civil Engineers, and general chairman, Construction League of the U. S.

Last month we printed the oil-burner code as approved. Since then the Oil Burner Code Authority has been organized with Morgan J. Hammers as chairman and has set up headquarters at 342 Madison Ave., New York. Mr. Hammers, vice-president of Petroleum Heat and Power Company, has been given an indefinite leave of absence to devote his full time to the organization of the work. The Authority has already started its activities and H. Finnie has been made chairman of a standing committee on uniform cost accounting, one of the essential procedures to be worked out for the industry under the code.

Not only production, but manufacture, harvesting, selling, distributing, or merchandising of ice at wholesale or retail are all regulated under terms of the code for the ice industry as approved by the President on October 3. The National Association of Ice Industries is the administrative organization. A Code Authority is established composed of five members selected by the Association and three appointed by the Administrator. Regional advisers are to represent the Authority in each district. Price schedules must be posted on the premises and filed with the Authority. One mill per ton of ice sold is set as a tentative assessment to cover cost of administration. Additional commercial ice-making facilities may be established in any locality only on satisfying the Administrator that they are necessary. Committees of Arbitration and Appeal are planned in each region. Office hours are set at 40 per week, and other employees work not over 48 hr. per week. Minimum wages are set at 32½ cents in the North and 23 cents in the South. Acts of unfair competition are

outlined at length, elements of cost are listed, and a uniform accounting procedure is to be worked out.

A Committee of Industrial Recovery of the American Boiler Manufacturers Association is the administrative body established in the code for that group as approved by the President on October 3. This code covers the manufacture of all types of steel boilers except those exempted by Presidential action. (A separate code covering steel heating boilers has since been approved—*Editor*). Moreover, stokers of more than 36 sq. ft. of grate area, pulverized fuel equipment, superheaters, air preheaters, economizers and Class I welded pressure vessels are all included. Maximum hours of labor are set at 40 per week with minimum wages of 40 cents per hour, except in the South where the rate is set at 34 cents. A $15 per week minimum is also established for labor other than that directly incidental to the manufacture. The shop contract method of paying labor is prohibited. A full-time manager is provided to whom statistical and similar reports shall be made. A standard contract form is to be worked out and members are prohibited from signing any other kind. Maintenance guarantees are taboo. Performance guarantees are permissible if definitely stated. Penalty clauses will not be accepted without corresponding bonus clauses. The list of unfair practices is extensive with a total of 19.

Of the several codes which have had hearings but are not yet approved, the majority are manufacturing codes so drawn that they cover manufacture only. One covers wholesalers, two are for contractor groups, and one is for the professional group.

In those which deal with manufacturing there is great similarity of form and provisions. Forty cents per hour and a 40-hr. work week are common. Those of most direct interest in this group are the warm-air furnace code and that of the cast-iron boiler and radiator industry on which hearings were held in the latter part of October (see details on pages 31-33).

A movement is under way looking toward correlating the manufacturing codes with some kind of master code intended to govern the whole industry. No definite results from this movement have been announced.

The situation regarding the construction side of the industry is still confused but is becoming clarified to some extent.

For one thing public statements by persons close to NRA make it evident that the importance of construction is fully known and appreciated. Also, it seems to be recognized that careful planning is required. Hints thrown out point toward the conclusion that the Administration would like to devise a plan for persuading construction which might be deferred for some years actually to get going now. One suggestion is that construction labor take reductions to make costs more attractive to prospective builders. Organized labor leaders have shown little sympathy, however, and counter with the suggestion that real estate manipulators and "fee gougers" on financing might well be curbed before labor is asked to stand the brunt of lowered costs.

From all the manoeuvering it is apparent that some serious thinking is being done in attempts to revive construction. This is no doubt holding up progress in approving the construction codes, for their form and details must fit into the plans finally adopted. So far as the codes themselves are concerned a good deal of progress in their formulation is being made.

For some time it was not at all evident how the construction codes would be handled. Since the Construction League of the U. S. appeared in the picture with a blanket code and with individual codes for each contractor and professional interest, it now seems settled that this is to be the final set-up. Substantially unanimous agreement to this plan has been obtained by persuading the various interested groups to write into their codes the provision that the master code of the League is recognized as such. So far there has been no public statement from NRA as to its attitude but from the course of events no other conclusion can be drawn but that the plan has the approval of the Administration.

Public hearings looking toward the completion of this method of handling have gone on steadily during the past month. Nearly all of them have now been held. Two of especial interest were those of the professional engineer group and the master plumber group held on October 9-10, respectively. Details of these hearings are reported elsewhere in this issue.

Master Code for Manufacturers is Projected

A PROPOSAL for a master code for the various manufacturing groups which produce products for use in heating, ventilating, or air conditioning appeared during the month. This plan provides for an Institute of Heating, Ventilating, and Air Conditioning which would act as the sponsor body for the master code. Eighteen manufacturer groups, according to the detailed plan now under consideration, would hold membership in this proposed Institute. Each of these groups would have its own separate sub-code and would appoint a member to a Code Authority set up under the Institute. One proposal would make the chairman of the control committee of each sub-group a member of this Code Authority of the Institute.

A master code embodying these general ideas has been drawn up and is being circulated among those concerned as a preliminary step. Our latest advice is that 11 of the sub-groups have now indicated general agreement with the principle. Actual organization of the Institute is not yet accomplished but there is reason to believe that this or some similar organization will be formed in the near future.

The general plan resembles the one toward which the construction industry is working with the Construction League of the U. S. as the sponsor of a master code. The proposed Institute would correspond roughly in the manufacturing side with the position of the League on the construction side.

Proposed Professional Engineers' NRA Code Would End Price Competition and Free Engineering

Features of the NRA Code for Professional Engineers. Reports of the public hearing on the code October 9. Engineering societies approve code. Employee organizations' objections. New York engineers want higher minimum salary. Consumers to file separate brief. Cost fixing questioned.

OBJECTIONS to the proposed professional engineers' code by employee organizations, suggestions by various organizations for changes of certain clauses, notification of the filing of a separate brief by consumers, and the recommendation by the labor adviser regarding hours of work, were among the important developments in the hearing on the Engineers Code, held in Washington October 9.

Hearing on the code, as submitted by the American Society of Civil Engineers, took place in the Caucus room of the new House Office Building at 10.30 a.m., with Deputy Administrator Malcolm Pirnie presiding. The NRA was also represented by Lawrence Knapp and G. A. McNulty of the legal division, A. F. Randall of the research division, J. Downer, industrial division, C. R. Rosemund of the labor division, and F. E. Huhlein of the consumer division.

Opening the hearing, Administrator Pirnie asked Mr. Knapp to outline the procedure, following which he called on Alonzo J. Hammond, president, American Society of Civil Engineers,† to make a statement regarding the proposed code. He briefly set forth the reasons why the A.S.C.E. should sponsor the code for professional engineers in the construction industry, and outlined the importance of this industry. He stated that he had appointed a central committee and four subcommittees to gather accurate data on which to base fair rates of pay for the several parts of the country.

Actual preparation of the code was by a committee of which Carlton S. Proctor is chairman. At the suggestion of Mr. Hammond and the request of Mr. Pirnie, Mr. Proctor then formally filed the code together with the required statements such as that the sponsoring body is representative.

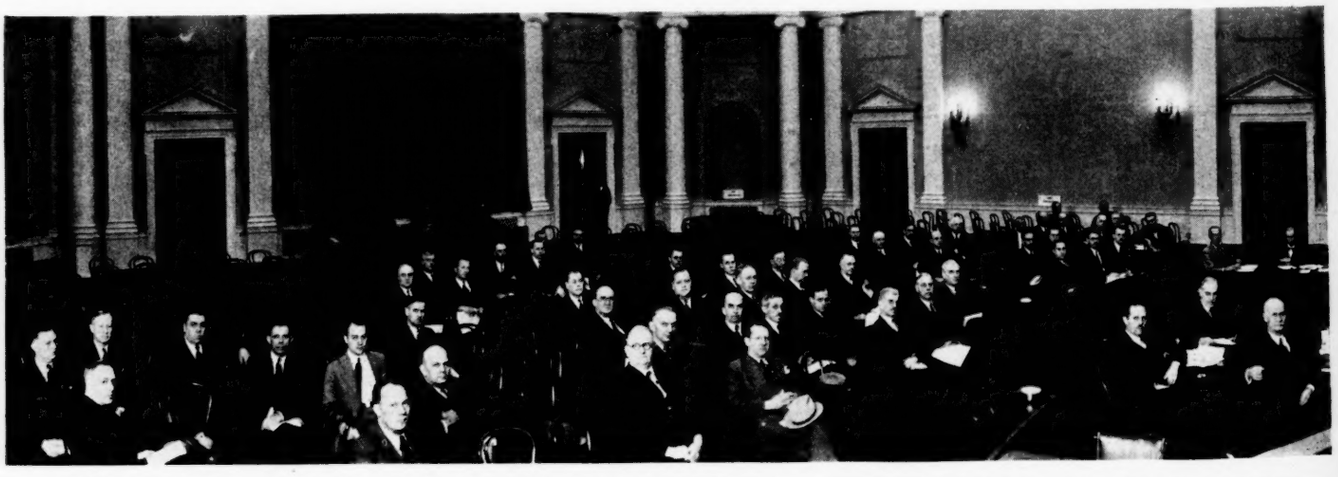
The code formally filed is that which is marked 969B, Registry Number 1719-2-18, and is as revised September 18, 1933. It is obtainable from the Superintendent of Documents, Washington, price 5 cents. As it is merely proposed and in no wise officially approved by NRA, it is not printed in full here. A brief outline of its contents is presented on a separate page.

Urges End of Engineers' Price War

Following his formal presentation of the code, Mr. Proctor read a statement outlining the conditions under which it was drawn. He urged that destructive price competition between engineers should be stopped and that the practice of passing along the engineering services to others should be prevented. He urged that adequate compensation be allowed but pointed out that the adequacy varies greatly in different parts of the country. These things the code as presented attempts to do.

Mr. Proctor also offered an amendment to the preamble which revealed that the following organizations

†Mr. Hammond is also general chairman of the Construction League of the U. S.



NRA hearing on code for professional engineers in the construction industry, held October 9 in the Caucus room of the New House Office Building, Washington, D. C.

had approved the code: American Society of Mechanical Engineers, American Institute of Consulting Engineers, American Association of Engineers, American Society of Heating and Ventilating Engineers, American Society of Municipal Engineers, The New York Association of Consulting Engineers, Structural Engineers Association of California, Chicago Structural Engineers, New York State Society of Professional Engineers; Oregon Technical Council; Western Society of Engineers; Connecticut Society of Civil Engineers; Florida Engineering Society; and Rochester Engineering Society.

"I am not quite clear whether the hearings on national [NRA] codes are not quite as important from the point of view of education as from the point of view of industrial organization"—

A. A. Berle, Jr.

The hearing was then opened to statements by those wishing to be heard. Mr. Pirnie announced that the procedure would be to take up the code, article by article. (This procedure had the effect of making the remarks of those who spoke discontinuous. In order to bring them together the actual order of presentation is departed from in the rest of this report).

Jacob Jay appeared for the Federation of Architects, Engineers, Chemists and Technicians. He stated that his organization has a membership of about 3000 with chapters in a number of cities including Baltimore, New York, Philadelphia, and Erie, and that it is an employee organization. He objected that the A.S.C.E. is not representative and that its members had not given it power to represent them on economic matters. Neither had the A.S.H.V.E. any such authority from its members. He raised four objections to the competency of these organizations to represent employed engineers: (1) they are neither employee nor employer organizations; (2) voting power is restricted; (3) employers dominate them; (4) the membership was not consulted.

He also objected to the classification of engineers as set up by the code in that the code provision would be too restrictive. He felt that the minimum wage provision was entirely inadequate and proposed a classification and a wage scale. Over 4000 unemployed engineers are destitute in the New York area alone, he stated, and this situation would not be relieved without a new wage scale. He felt, too, that maximum hours of 48 per week were entirely too high and proposed 30. Wage scales beginning at $65 per week and a $30 minimum to be set at once were his suggestions.

The restriction against a full-time salaried engineer trying to find outside employment was inequitable in his judgment and should be removed from the code.

He and his associate Mr. Jules Korchien also objected to the administrative body proposed. They thought that amendments should be permitted by others than the sponsoring bodies. Mr. Korchien proposed that a joint standing committee containing equal representation from employees and employers should be provided instead of the National Control Committee as established in the code.

Daugherty Stresses Importance of Equipment

Frank Daugherty, representing the Association of Consulting Professional Engineers of Philadelphia, suggested changes in the detailed wording of the definitions set up by Article II of the proposed code, changes he thought would clarify the meaning. He felt that more stress should be placed on the equipment items of construction in these definitions and pointed out their importance in building work. Further, he believed that the provision in the code which makes written agreements necessary only when the fee involved is $1000 or more should be reworded to make such an agreement compulsory regardless of the amount of the fee. Moreover, the practice of contractors of furnishing working drawings should take place only after the contract is awarded, and not before. He suggested that engineering supervision of the work should always be provided and that the code wording be amended to make this possible. His opinion, too, was that the administrative body should represent the professional element in the field rather than the entire membership of the various engineering societies which, he stated, contain only a very small percentage of consulting professional engineers.

In behalf of the New York State Society of Professional Engineers, its president, Arnold G. Chapman, offered a series of rewordings to the suggested code. He wanted revised statements of Articles I and II which in his opinion would make them more clear as to what an engineer is and what he does. He thought that a temporary minimum wage of $30 per week should be used until such time as the regional inquiries can set up a more permanent schedule. The National Control Committee, too, should provide for a minority membership representing the interests of engineering assistants who are not members of societies. He also proposed that local or regional committees should provide for employee representation.

Deputy Pirnie asked the NRA labor adviser, Mr. C. R. Rosemund to present his statement. Mr. Rosemund thought that the hours set up in the code were entirely too high and that older men out of jobs might better be employed than to permit employing boys on part time. He remarked, too, that in his opinion the

(Continued on Page 15)

FEATURES OF PROPOSED PROFESSIONAL ENGINEERS CODE

PREAMBLE. Contains general and required statements as to true representation of sponsoring body, lists other organizations which have subscribed to it, etc.

Article I. Recognizes Construction League code, makes it a part of this proposed code, and provides that in case of inconsistencies the professional code shall yield to the general one.

Article II. Definitions and Functions. This article is long and wordy. In substance, defines a professional engineer as one (a) operating in responsible charge of the design or supervision of construction work, or (b) licensed and in the employ of a professional engineer or firm; or (c) admitted to, or eligible to membership in, some organized engineering group, such as the A.S.C.E. When it comes to function the definition set up is exceedingly broad in wording. In substance, it states the duties that an engineer usually performs. Anyone who undertakes any of these functions, except an architect, is "deemed to be an engineer, subject to all the conditions of qualification and experience in the above definition of a professional engineer, and subject to all conditions and regulations of this Code." Where there is licensing, a licensed engineer may practice but must conform to the code provisions.

An "engineering assistant" is an employee who renders technical or other service of a sub-professional nature but who is not registered or licensed to practice engineering nor eligible to membership in a society like A.S.C.E.

Article III. Required Provisions. Usual statements guaranteeing right of collective bargaining, etc.

Leaves minimum wages to be set by National Control Committee set up in Article VI.

Maximum hours to be those of general code of Construction League.

Age limit set at 16 years, but persons from 14 to 16 may be employed not more than 3 hr. per day during daytime hours.

Article IV. Relations between Engineers and Clients.

Written agreement before proceeding with work if fee involved is $1000 or more. Agreement to be kept and made available to National Control Committee.

Engineer shall not: (1) Engage in any way in real estate or business interest affected by his work unless employer or client is informed and approves; (2) engage in contracting or benefit from contracting business affected by his work unless employer or client knows and approves; (3) accept any pay except that set forth in his agreement; (4) accept any fee or gratuity from anyone except his employer or client; (5) specify, direct, invite, or accept engineering services from interested contractors, subcontractors or supplier of materials, except shop and working drawings made by contractors for the work executed by them; (6) give any rebate, discount, bonus, fee or commission in order to reduce his fee, or in order to influence or procure employment on a salary or wage basis.

Article V. Unfair Practices. Schedules of fair minimum rates to be set up by National Control Committee within four months, and Committee shall also develop standards of cost accounting. In the meantime schedule of charges of A.S.C.E. to be the standard.

"When any person undertakes to provide engineering design or engineering services he shall be deemed an engineer in the meaning and application of, and functioning under this code, and as such shall make a separate and distinct charge for such designs or services as a separate account, said charge to be not less than the usual or prescribed professional charge made by engineers for such engineering design or other engineering services."†

Competitive bidding with other engineers is prohibited.

No free sketches or estimates for work on which another engineer is signed up.

Full-time salaried engineers not allowed to solicit or accept outside employment in competition with others.

"No person shall perform or undertake to furnish or be responsible for engineering services unless he is qualified by education, experience and organization as herein defined."

Bid peddling and secondary bidding prohibited.

Engineers shall be fair in making known requirements and in furnishing adequate information to bidders. Shall not ask for bids until he has developed adequate information and essential data. Shall permit contractors to satisfy themselves of adequacy and practicability. Shall include tolerances. Shall provide field supervision and inspection when engaged to do so.

Arbitration of disputes by recognized practices before resort to law.

Article VI. Administration. Amendments may be proposed only by truly representative professional engineering organizations like A.S.C.E. and through National Control Committee.

National Committee to be composed of one member from each of five sponsor societies and eight members from the A.S.C.E. Committee, to have charge of administration of code. Also to set up regional committees.

Each engineer to pay his equitable share of cost of administration.

†This covers the so-called "free engineering."—*Editor*

administrative committee provided should be limited to recommending matters subject to the approval of the Administration.

Consumers to Present Their Views

F. E. Huhlein of the NRA consumers advisory board thought that competitive bidding for obtaining professional services should not be wholly curtailed and stated that he expected to file a brief setting forth his views. He felt also that adequate consumer representation should be provided in the setup of the National Control Committee.

Representing the Associated General Contractors, Inc., E. J. Harding presented a brief outlining the comments and objections of his group. These covered virtually every article of the code and varied from slight amendments in wording to some which approached fundamentals. One of them was a proposal which would make the engineer who performs the contractor's function conform to the contractor's rules in the same way as the contractor who performs the engineer's function must conform to the engineer's rules.

Harris & Ewing

Deputy Administrator Malcolm Pirnie, who presided at the NRA code hearing for professional engineers

In closing the hearing Deputy Pirnie called attention to the problem brought about by attempts at cost fixing in some of the construction codes. As these tend to increase costs he feared they would defeat the purposes of the Act by actually decreasing employment and purchasing power, unless carefully correlated. He hoped that some stepping-up process could be found which would cause part of the construction which might come about five or six years from now to be transferred to the present. He also expressed the thought that the code committee would meet with those who had offered suggestions.

Following adjournment of the hearing many of those interested met for informal discussion and some progress was made in adjusting conflicting viewpoints among the representatives of the several organized groups.

Plumbers Protest Separate Soil Pipe Code

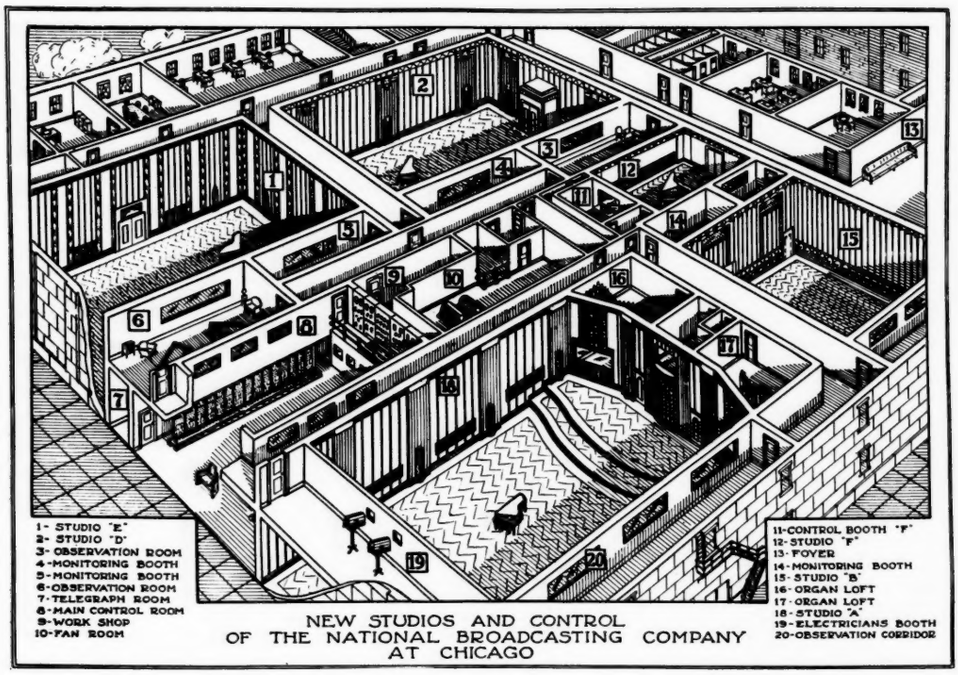
The status of the plumbing contracting code is both curious and unique in some of its aspects. It is reviewed briefly here because of its close relation to the heating contractor code.

Originally, the National Association of Master Plumbers, whose membership is made up of contractors, proposed a sweeping code which included manufacturing and trade distribution as well as contracting, heating as well as plumbing. With the appearance of the master code of the Construction League, it became apparent that this plan would have to be abandoned. First scheduled for a public hearing early in September, this group asked for a postponement to revise its proposals. The revised code came up for hearing on October 10. As revised, the code now covers plumbing only and applies both to contracting and retailing. In the meantime the President had approved a code for the cast-iron soil pipe industry, which code is vertical in form and permits distribution practices to which the contractor group objects because sales are permitted direct to retailers under terms which the contractors believe place them at a disadvantage. Virtually all of the public hearing was taken up by a statement presented by Patrick J. Hurley as counsel to the Association in which he set forth the position of the Association and its opposition to the selling practice approved in the cast-iron pipe code. He stressed the dominant position which the contractor has occupied in the distribution of plumbing goods, and urged that public health and sanitation require that the master plumber be recognized at his true worth. As contracting and retailing in the plumbing field are so closely allied the code presented by the Association covers both activities. Mr. Hurley made a strong plea for a definite recognition of two levels of distribution; namely, the wholesale and the retail.

The proposed code sets the maximum work hours at 40 and sets up a scale of minimum wages which varies with the population of the trading area. Actual minimum wage proposed is $12 per week. Journeymen rates vary from $1 per hr. to 80 cents per hr.; helpers and laborers 40 cents per hr. Rules of fair competition are outlined. The Board of Directors of the National Association of Master Plumbers is named as the responsible administrative body to cooperate with the Administration.

Air Conditioning and Sound Insulation of the N.B.C. Chicago Studios

By V. J. GILCHER†



NEW STUDIOS AND CONTROL OF THE NATIONAL BROADCASTING COMPANY AT CHICAGO

THE National Broadcasting Company's quarters on the 19th floor of the Merchandise Mart in Chicago occupy 62,000 sq. ft. of floor space, 40,000 sq. ft. of which are devoted to the broadcasting plant.

There are six studios in the plant, each with its complement of appurtenant rooms, such as technical control booths, clients' observation rooms, and visitors' observation rooms. Then there is the main control and equipment room with its associated rooms; the artists' reception rooms, musicians' rest rooms, operating personnel offices, and public and private corridors. Some of these studios are double height, as is the main control and equipment room. In all there are 76 subdivisions in the plant space totaling 430,000 cu. ft. The drawing shows the layout. Each receives its share of air conditioning from a system which delivers 63,000 c.f.m. with a refrigerating capacity of 190 tons and designed to cool the various studios and associated rooms during the summer months to an average dry bulb temperature not exceeding 80° and a relative humidity of 45% when the outside dry bulb or wet bulb temperatures do not exceed 95° and 75°, respectively. In winter a dry bulb temperature of 72° and a relative humidity of 45% is maintained in the conditioned spaces.

These atmospheric conditions are maintained by means of thermostat regulators of the bi-metallic expansion type installed in the rooms which function to control automatically the temperature and air flow to the individual supply ducts.

Varying load conditions in the studios and other rooms necessitate a sensitive and well-balanced automatic regulating system. For instance, large groups of musicians and visitors suddenly enter a studio previously unoccupied, rapidly increasing the temperature and humidity. If colored lighting effects are a part of the studio's decorative scheme they may be put on at the same time. This studio is occupied for the duration of the broadcast period, 30 min. or 1 hr., and is as suddenly emptied. Just prior to the evacuation of this studio another large group of people may be entering another studio previously unoccupied. It is also possible, and often the case, that all studios are filled to capacity at the same time, imposing maximum demands on the air conditioning system.

Many celebrities appearing before the microphone attract press photographers and motion picture interests, to say nothing of our own photographic activities for publicity purposes. The use then of a number of high intensity arcs and incandescent lights in several studios at one time must also be taken into consideration. Reference might well be made to the amount of power made available in the studios for photographic purposes. The four larger studios have a supply of 100 kw. each while the two smaller ones have 50 kw. each.

†Plant engineer, National Broadcasting Co., New York.

Considerable stress is placed on the importance of proper architecture and decoration in the belief that this has a desirable psychological effect on the mood of the artists which influences their performance. Decoration is inclined to be elaborate and lighting fixtures designed to harmonize with their particular surroundings are at times very ornate but inefficient. Consequently, the wattage used to obtain the required illumination of 18 to 20 ft.-candles evenly distributed at working level is sometimes very high. This applies in particular to the large double height studios. Modern stage methods of creating color harmonies by means of elaborate lighting systems concealed in open troughs and in pilasters are also used extensively.

Another item of importance in connection with heat radiation in the studios is the possible application of ultra-violet or "sun" lamps for health-maintenance purposes. An experiment of this nature is being carried out in studio A where 36 sun-lamps are installed in the ceiling in addition to the ordinary utility lighting fixtures. The wattage dissipation from this type lamp is high with respect to the desired percentage of ultra-violet radiation.

Table 1 shows the wattage dissipation in each of the six main studios of the plant along with the maximum number of people per room. The wattage rating for studio A is high as compared to the others because of the mercury-vapor sun lamps previously mentioned.

Steam is furnished to all heating coils in the air circulation system at approximately atmospheric pressure, with a vacuum return. Direct radiator heating is not used in the conditioned areas with the exception of a few offices and other rooms with openings to the outside.

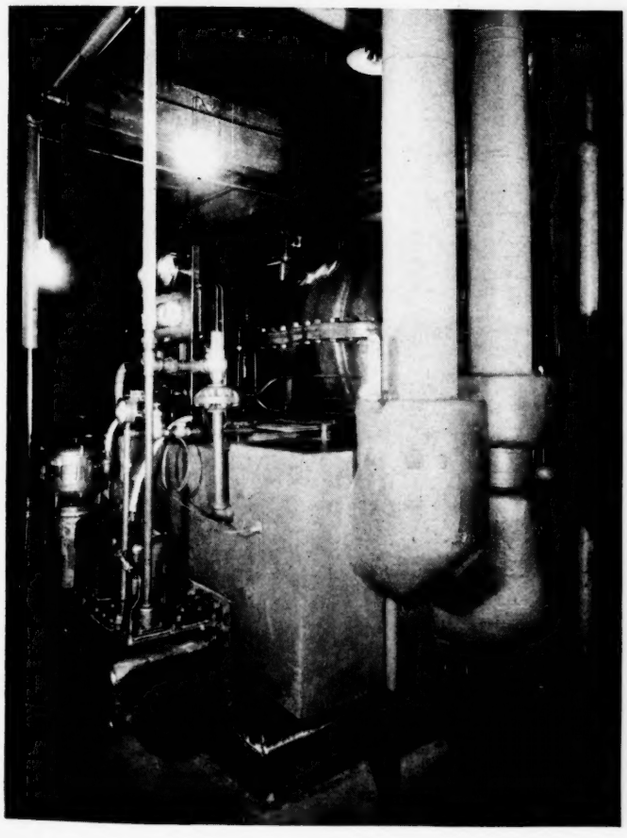
TABLE 1
HEAT DISSIPATION OF LIGHTS, AND POPULATION DATA, IN SIX N.B.C. STUDIOS IN CHICAGO

	Cu. Ft. Area	Wattage Dissipation (Lights)	Max. Population	Max. C.F.M.	Max. Air Change Rate
Studio A	79,000	29,500	184	12,000	7.5
Studio B	27,500	4,500	66	6,300	4.4
Studio C	4,500	1,640	26	3,250	1.4
Studio D	45,000	8,000	94	7,300	6.2
Studio E	42,500	8,000	91	7,600	5.6
Studio F	4,300	1,140	26	3,700	1.2
Main Eq. Room	22,164	2,200 + *2,000	5	2,100	10.5

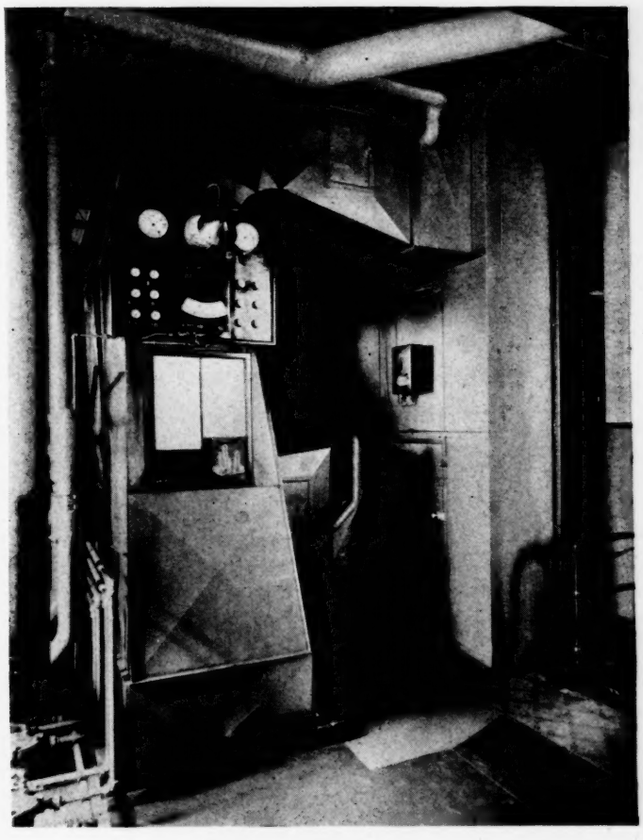
**This figure is the wattage dissipation of vacuum tubes and other apparatus used in connection with the speech transmission equipment installed in the main control room.*

Air circulation, dehumidifying, and control equipment is located on the 20th floor and in a penthouse immediately above. The fresh air intake in the penthouse is equipped with a fin-type steam preheater to raise the temperature of the incoming air during the winter months. Following this the incoming air enters the spray chamber where it is washed and humidified or dehumidified as the case may be. Spray water is delivered to the dehumidifying chamber spray heads from the refrigerating machine located in the basement of the building. The refrigerator is a 190-ton centrifugal unit driven by a 250-hp. motor. The dehumidifying chamber is under suction from the main supply fan, a multivane unit, which delivers the saturated low temperature air from this chamber through filters to the supply chamber.

Supply ducts for the studio sections branch out from the supply air chamber and are pressure-fed from the



Centrifugal refrigerating unit in the basement of the Chicago studios



One of the air supply ducts showing draft gauge and instrument board

main supply fan. Fin-type reheaters and air flow control dampers are installed in the entrances of each sectional supply duct. These reheaters heat the incoming air to the final room temperature and in conjunction with the air flow dampers function to maintain constant atmospheric conditions in the studios and other rooms. Compressed air motors and diaphragm steam valves controlled by the thermostats in the various rooms operate these two units regulating the amount of air flow in the ducts and steam to the reheaters.

The exhaust fan, with its discharge chamber, is located on the 20th floor. This fan also is of the multivane type. Return air is delivered to the discharge chamber from the main exhaust fan. Exhaust air from the discharge chamber may be discharged directly to the outside, or it may be recirculated either through or around the spray water. Individual control of these three ducts is provided to secure flexibility of operation.

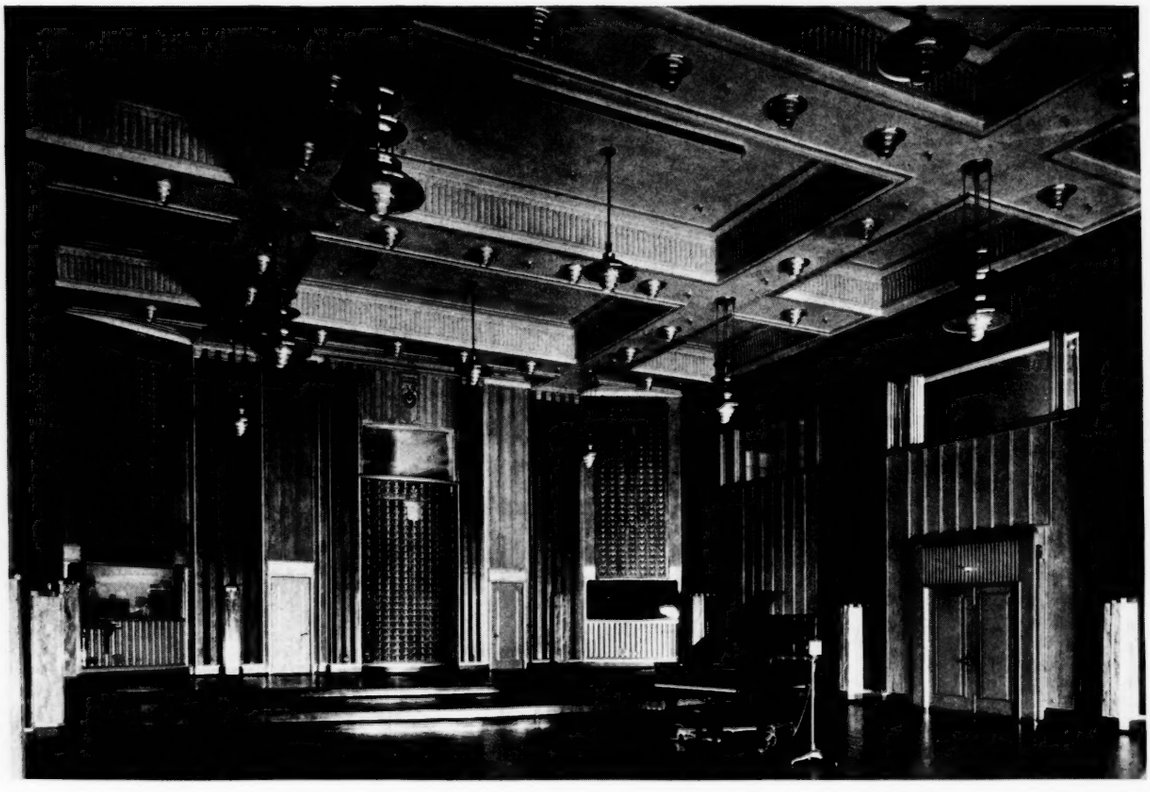
The supply and exhaust fans were selected to have the most suitable characteristics essential to noise reduction and control. First, the fans are belt-driven devices which isolate the motors from the duct systems, thereby eliminating two major sources of sound; namely, motor eccentricity and field coil hum. Second, the fans themselves are so designed as to minimize fluctuations caused by the blades passing protuberances within or in the immediate vicinity of the housing. Third, the design of the unit is such as to influence those inherent noises which persist and cannot be eliminated economically to be of a frequency easily controlled in the duct system.

Isolation of mechanical energy originating in the fans is accomplished by means of canvas connectors between the fan housings and the duct systems. All motors and other machinery are mounted on sound-insulated foundations to prevent the production or transmission of noise and vibration.

In all studios and in most cases throughout, the supply openings are centrally located in the ceilings and air distribution to the rooms is downward against "splash" pans which diffuse the air in all directions. These pans are usually of ornamental design to suit the architectural interior. Air velocities are reduced at the supply openings to minimize air friction noises and the "splash" pans are covered with sound absorbent material on the side facing the duct opening to further attenuate such noises. Velocities in the exhaust openings are also kept low to prevent air rush noise through the grilles and the grilles themselves are specially designed to reduce friction and turbulence.

Exhaust openings are located in the walls near the floor in positions best suited to good air distribution with respect to the physical proportions of the various rooms. Elaborate decorative treatment in the studios necessitates the selection of exhaust grilles of proper pattern and design to harmonize with the surroundings. Grilles selected under these circumstances sometimes contain a relatively low percentage opening. Where such was the case in the Chicago plant, the problem was met by an increase in the grille and duct mouth areas so as not to increase the air velocity through the grille.

Extreme care was taken so that the ducts did not come in contact with the floating members of the studio construction, otherwise mechanical vibration carried by the metal duct would be transmitted to the room interior. This isolation was accomplished by means of



Two pan-type ceiling supply openings are visible in this view of Studio A. One of the exhaust grilles is shown behind the piano. The fixtures flush with the ceiling are mercury arc sun lamps

a flexible canvas connector between the duct and the ceiling opening. This method of isolation is used for all supply and exhaust openings.

All ducts 250 sq. in. or more in area are stiffened at intervals of 4 ft. with angle iron carried completely around the duct to prevent sound wave radiation from the sheet metal panels in response to mechanical vibration energy existing in the duct. Care was taken to properly secure the ducts and their hangers to prevent vibration due to loose connections. Ductwork is of rectangular panel type construction and the panels are creased diagonally for stiffening to obviate vibration caused by the air moving through the duct. All ducts, both exhaust and supply, are wrapped over their entire length with a blanket of insulating material to prevent vibration and noise transmission to the ducts through possible contact with other construction.

Sound absorption chambers are installed in all supply and exhaust ducts. These are generally inserted not very far from the duct openings into the rooms. In addition the ducts are lined inside over substantial lengths with absorbent material. The lengths of duct lining necessary is dependent on the type of absorbent material used, the size (cross-section area) of the duct and the overall absorption coefficient required, the latter, in turn, being determined by the frequency and intensity of the disturbing sound. Naturally, this applies only to noises traveling in the form of wave motion in the air stream as absorbent materials within the duct have no absorption value in connection with mechanical vibration in the duct metal.

There are several materials of reasonably good absorption characteristics on the market which are suitable for use as duct lining. In selecting material for the lining of ducts in broadcast plants, consideration must be given to the fact that the disturbing sounds extended over a wide frequency range, consequently the material used should have a reasonably flat absorption characteristic over a corresponding frequency range. Care should also be taken to select a material that does not shed or disintegrate, otherwise it will be a continual source of dust in the air stream.

A permanent recording temperature recorder is located in the 20th floor equipment room. Its function is to continuously record temperature readings of 16 thermometers installed in strategic points throughout the plant. One minute is required to record each reading making a total of 16 min. to complete the cycle.

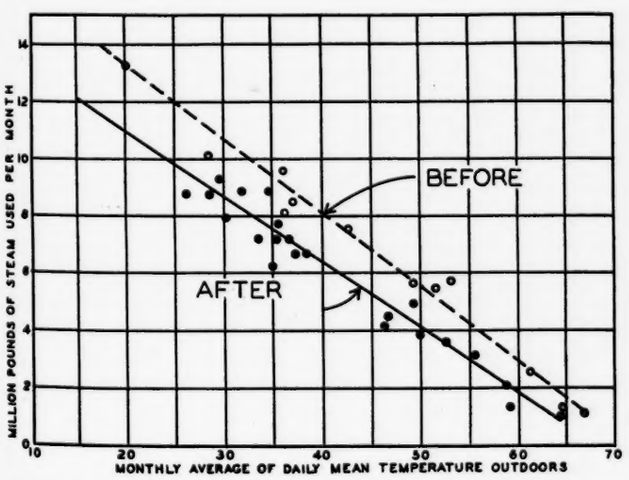
The Chicago air conditioning system is in operation during the entire broadcast period of 18 hr. daily—from 6 a.m. to 12 p.m.—365 days of the year. It is operated and maintained by a staff of six men including the supervisory chief engineer. The plant was installed at a cost of $126,000.

DEGREE-DAY SERVICE EXTENDED

Beginning with this issue, the Degree-Day page, which appears in the back section of HEATING AND VENTILATING each month through the heating season, will give complete degree-day information for 48 of the larger cities, where formerly only 24 cities were covered.

Simple Method of Indicating Fuel Savings

ANY manufacturer of heating apparatus, the use of which will result in fuel saving, is confronted with the problem of overcoming resistance in the mind of the prospect who has become skeptical about the remarkable claims which have been made for equipment in the past, and which his experience has shown have been exaggerated.



Simple method of indicating savings of fuel after installing control systems and correcting for change in weather conditions

The problem of convincing such a possible buyer is further complicated by the fact that even actual records are sometimes questioned on the basis that "Yes, but that was a mild winter."

Use of the degree-day in making corrections for weather changes has helped the seller in some cases, particularly with engineers. Although the degree-day method is fairly simple, it is still somewhat involved to use in convincing a layman, who might retain some feeling that something was being put over on him.

In order to overcome this, F. I. Raymond has suggested a method shown in the accompanying graph. The comparative amount or cost of steam before and after heat control equipment was installed is plotted against the monthly average of daily mean outdoor temperatures. In doing this the months are listed according to the corresponding outside average temperature of the two seasons, establishing the authenticity of the graphs in a simple way.

Chicago District Heating Plant Financing Under Way

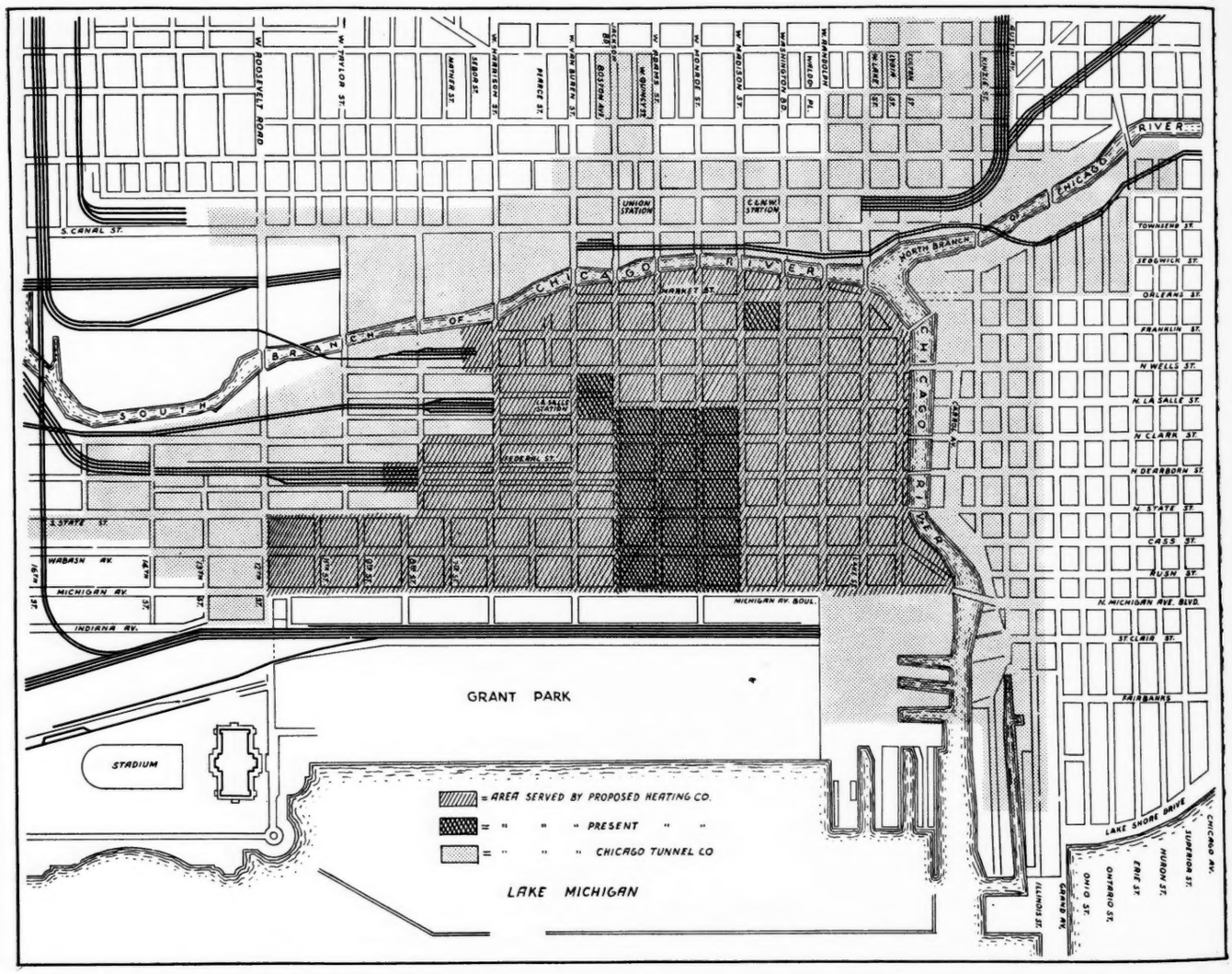
NEGOTIATIONS are progressing for financing the the mammoth district heating project to supply Chicago's downtown business section, according to Sherman W. Tracy, president of Chicago Tunnel Company, and John J. Mitchell, president of Chicago Tunnel Terminal Company, owner of the former company, which will operate the plant. The plan contemplates the use of the tunnel company's underground passages for the steam mains, so that little if any excavation will be needed.

The Reconstruction Finance Corporation authorized a loan of $4,625,000 to the company last June for a steam distribution system, but due to limitations of the act the steam generating plant had to be completed with funds from other sources. Application has been filed with the Federal Administration of Public Works for a loan of $10,500,000 with which to complete the work.

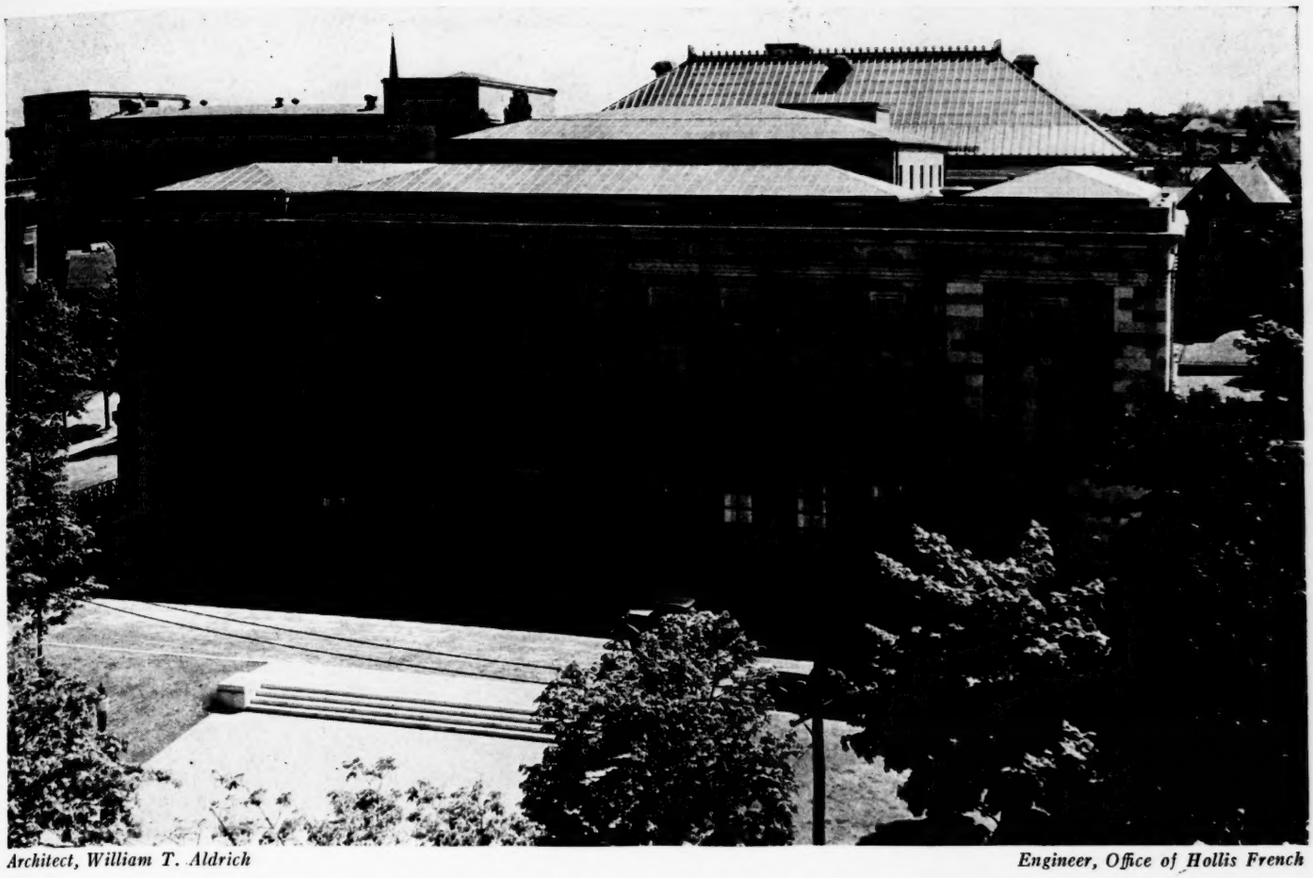
Neiler, Rich & Co., Chicago, will engineer the project, and Graham, Anderson, Probst & White, Chicago, are the architects. Approximately 60% of the stock of the company is owned equally by Mrs. J. Ogden Armour and the sons of the late E. H. Harriman.

It is estimated that two billion pounds of steam will be sold the first year to supply 20% of the Loop's big buildings, and with 60% of the buildings purchasing steam, more than six billion pounds will be sold annually. Present plans are to burn Illinois coal exclusively, 600,000 tons of which will be required per year. The location of the site of the steam generating plant has not yet been determined.

Chicago has and has had for many years a district heating plant which serves certain districts. This is the Illinois Maintenance Company, a wholly owned subsidiary of Chicago's Commonwealth Edison Company, which in 1930 sold nearly 800,000,000 lb. of steam to 80 customers having about 1,500,000 sq. ft. of connected radiator load. The system is of the "block" type, in that a group of several buildings is heated by a boiler plant located in the basement of one of them. Several of these smaller groups are interconnected into larger "systems."



Map of Loop section of Chicago showing districts served by the Chicago Tunnel Company, part of which will be used for district heating mains. Map also shows the territory now being served by the Illinois Maintenance Company



Architect, William T. Aldrich *Engineer, Office of Hollis French*

Fig. 1. Worcester Art Museum. In the foreground is the new building, while the old building can be seen in the rear.

Proper Air Conditions Preserve Museum Pieces

A description of the heating and air conditioning of the addition to the Worcester Art Museum

By C. EUGENE CENTER

IN designing a system of heating and air conditioning for the recent addition to the Worcester (Mass.) Art Museum, the engineers were faced with the problem of maintaining the proper temperature and humidity not so much for the comfort of visitors as for the prevention of the deterioration of paintings and drawings due to varying air conditions.

Boiler Room Equipment

Since the new building contains half again as much floor space as the present building, it was necessary to discard the original boiler room equipment and install apparatus which would handle the combined heating load of the two buildings as well as the extra ventilation. The original pair of 50-hp. H.R.T. boilers, some 40 years old, were removed altogether and replaced by two 130-hp. low head H.W.T. cross-drum boilers containing 1300 sq. ft. of heating surface each. They are fired by modern industrial type oil burners replacing the original 15-year old pair. The only space available in either building for the new boilers was in the old boiler room. Except for having to go down an additional 6½ ft. the new ones occupy no more area than did the old.

An interesting feature is the use of the new type of "air puff" soot blowers. These were used because the low-pressure steam (10 lb.) would not give enough pressure to operate satisfactorily the conventional type of steam blower. Four automatic units per boiler are operated under 120-lb. air pressure. Operation is entirely automatic from the moment the starting button is pushed. Soot is blown from the boiler passes connected to the first unit; a timing apparatus disconnects

the unit, waits until the air pressure is built up in the receiver and then connects the second unit to its group of passes, and so on until all passes have been blown.

One 35 g.p.m. duplex return-line vacuum and low-pressure boiler feed pump takes care of the returns from the radiators of both buildings. Because of the lack of space in the boiler room, and to avoid the use of lift pockets due to a 7-ft. difference in grades, the pump was placed in the apparatus room in the new building and a signal light on the boiler room switchboard indicates when it is operating.

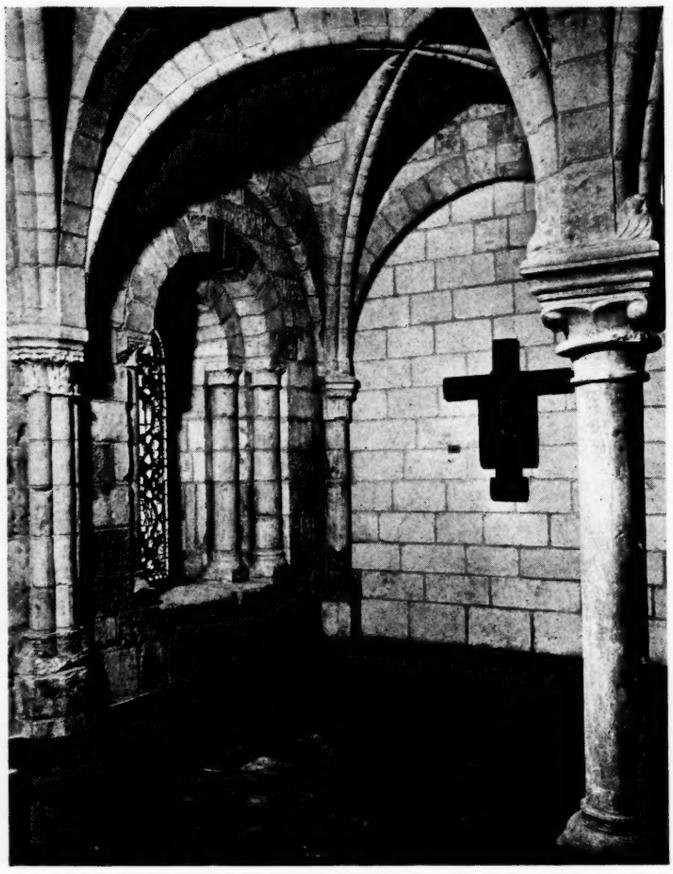


Fig. 2. In the chapel the unit heater is below the floor line with a grille in the rear of the window sill.

Heating System

The heating system is a combination of direct and indirect systems. While the direct radiation alone will maintain the temperature when the building is unoccupied, the fans are ordinarily operated because of the importance of keeping a constant humidity on the canvasses. A two-pipe vacuum system was selected to supply the direct radiation as it gave the best results under the conditions and necessitated but slight changes in the original arrangement. Steam is reduced to from 0 to 2 lb. pressure to supply the concealed and direct radiation in the basement, on the ground floor, and the exposed radiation in the attic of the new building. Since there are no windows or outside entrances and there is no temperature difference between the glass ceiling and the attic space above, the only heat loss being through the exposed walls, heat is supplied the galleries of the first floor by a hot blast system from supply fan S-2. The basement and ground floors are supplied by a split system from fan S-1.

Positive Ventilation of Skylight Spaces

The handling of the air in the attic and skylight space over the galleries and central court, and the resulting effect on conditions on the floor below, is one of the features of the installation. Thirty six hundred square feet of radiators are provided in these spaces and the steam mains and radiators are set high on the walls in order to melt any snow accumulating in the roof gutters. In order to diminish the heating effect of the lights which illuminate the first floor galleries from above the sub-skylights, and of the sun in summer, 18 36 in. $\times$ 18 in. intake louvers are located at the ends of the east, west, and north attic spaces. The air is vented through two 5000 c.f.m. 42-in. disk fans and two 2200 c.f.m. 24-in. propeller fans which exhaust to the outside through conical stationary ventilators. Air from the space over the main central court is vented by a 6000 c.f.m. fan in the attic fan room. Two thermostats in each skylight space control motor-operated intake dampers at the louvers and motorized valves on the steam mains in the following manner: at a temperature of 75° the thermostats open the louvers, start the ventilating fans, and close the steam valves so as not to supply steam to the radiators unnecessarily. The radiator direct controls are set to operate at 65°, this 10° differential giving greater operating economy. This method of operation gives positive ventilation and prevents the extreme conditions of summer and winter affecting the rooms below, which would happen with stationary ventilators and natural draft.

Basement Dampness Eliminated

Because of springs under the foundations, it was found that there was a possibility of considerable dampness in the tunnels and basement during the summer months which might be injurious. This problem was effectively solved by laying parallel courses of tile under the basement floor and arranged at right angles to the outside walls in such a manner that air can be drawn through the spaces into the largest steam line tunnel. Here it is exhausted to the outside through a 6020-c.f.m. fan and duct.

For the proper preservation of paintings without the cracking incident to alternate drying and dampening under certain conditions, the picture storage rooms in the basement are supplied with tempered air through mushroom inlets in the ceiling. Direct radiators are also provided.

Ground Floor Split System

Although there was a ventilation system in use in the original building, this was discontinued when the addition was built as most of the rooms are now used for purposes which do not require the close control of humidity. Some circulation is provided from the sys-

tem in the addition and it is planned, if necessary, to install another humidifier and duct system for the old building in the future.

The entrance hall on the ground floor of the new building is supplied by ducts on either side of the central revolving door. Extra heat to counteract drafts from outside is furnished by a 1200-c.f.m. unit heater in each duct just below the floor line. The chapel is similarly supplied, with screened slots in the ornamental stonework and a 900-c.f.m. unit heater in each of two ducts. Control is from two special solid bronze room thermostats finished to harmonize with the stone interior, each of which operates a motorized valve governing the 10-lb. steam supply to its respective unit heater.

The direct radiators in the seven galleries, reception room, and directors' room on the ground floor are recessed into the outside walls beneath the windows with the top grilles in the sills and slots at the bottom. The tempered air ducts and grilles are located on the inside walls and finished to harmonize with the wall coverings. There is no direct radiation in the central court or the arcades. Six thousand cubic feet per minute are supplied to the court by four ornamental bronze grilles located near the floor line. Since there are no exhaust ducts in the entrance hall or chapel, air circulation is from these rooms toward the court. Ornamental exhaust grilles are spaced symmetrically around the court just below the sub-skylight and a slot extended entirely around the perimeter of the skylight is also provided for ceiling exhaust.

The dark room in the attic is supplied with 225 c.f.m. of tempered air and is vented to the main ventilating system. This room, and the utility, repair, and photography rooms, are heated by direct radiation. The latter two are ventilated by saw-tooth skylights totalling 100 sq. ft. of hand-operated louver area. All toilets are vented by a separate duct system and the air is exhausted to the outside by a 2400-c.f.m. ventilating fan in the attic penthouse.

First Floor Hot Blast System

Dampers in the ventilating ducts of the first floor galleries are so arranged that they cannot be closed entirely. Thermostats of the exhaust ducts (behind the grilles) in each gallery operate motor dampers in each supply and exhaust duct to reduce the volume of air entering and leaving the room when the thermostats are satisfied and to increase the flow when needed. Grilles on this floor are located on the inside gallery walls.

Ventilating Fans

The air from the ventilating ducts of each room is taken through two main ducts to the two main recir-

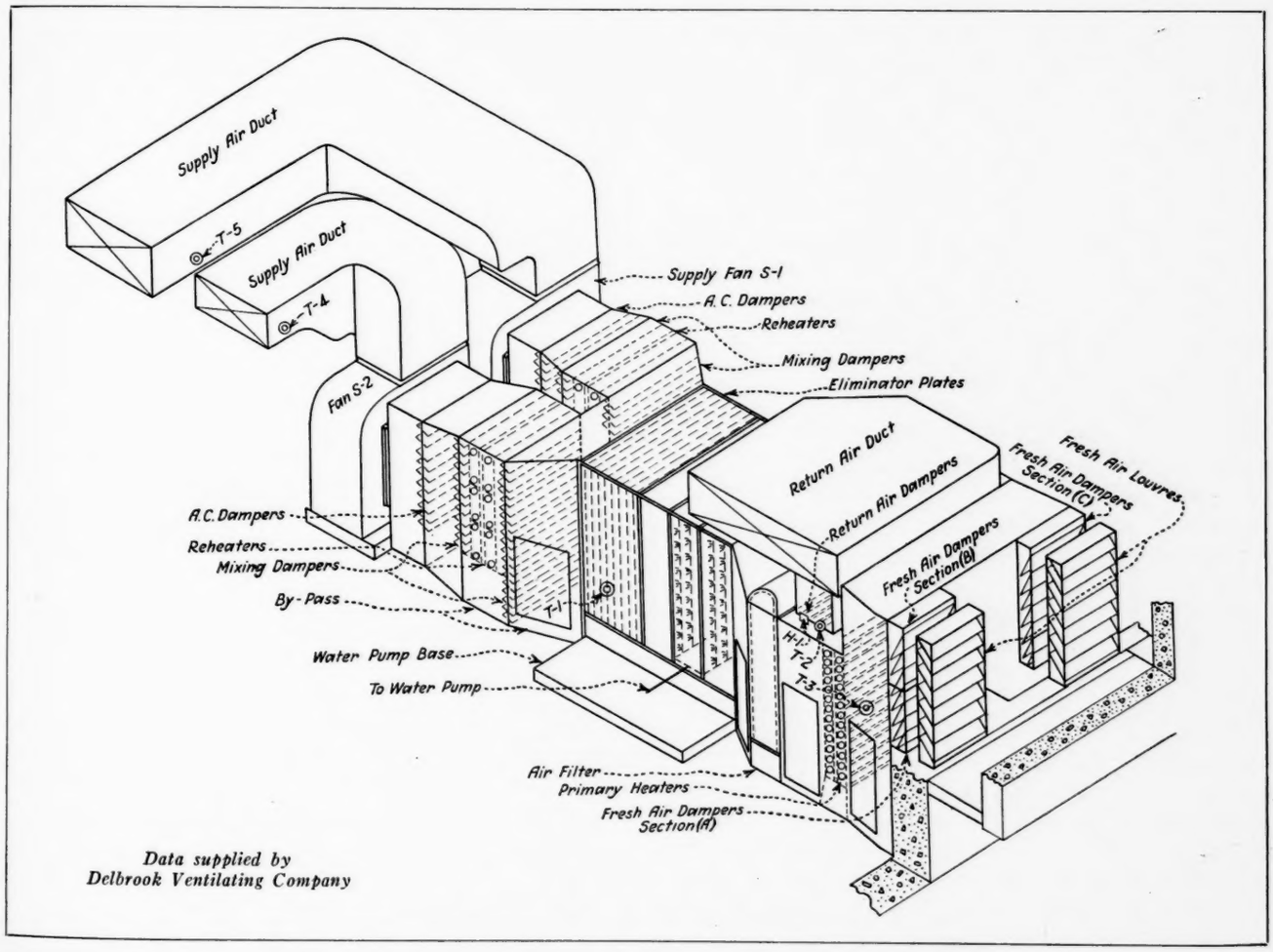


Fig. 3. General arrangement of the air conditioning equipment

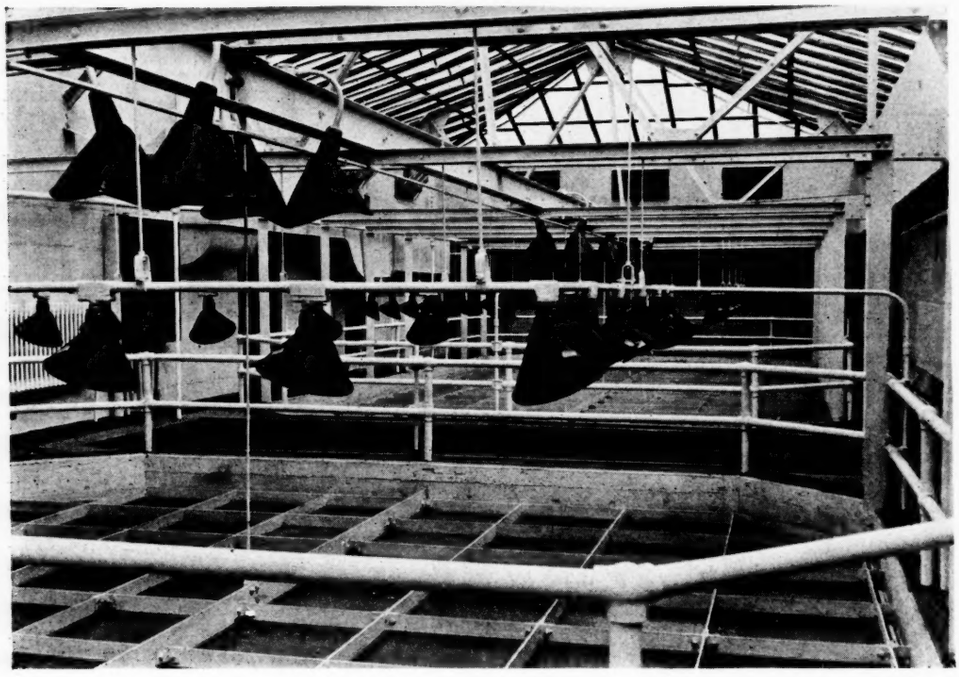


Fig. 4. East skylight space in the Museum. To the center left is shown the direct radiator and to the right of this the ducts to the main exhaust fan. The black rectangulars overhead show the air conditioning dampers and intake louvers.

culating fans in the skylight space over the central court. These are of 20,400 c.f.m. and 16,680 c.f.m. capacity, respectively, and their exhaust ducts are combined into one large return air riser. At the top of this duct are louvers in the exterior wall so that the vented air may be either discharged outboard or returned to the basement fan room. This method of using both supply and recirculating fans prevents sluggish movement in those rooms at the ends of the longest ducts and gives a responsiveness of control not possible where a single fan is used for both supply and recirculation.

Humidifying Equipment

The humidifier is of the high-pressure, double-spray type to take care of the cooling and dehumidifying apparatus which is to be installed at a later date. The cooling unit will be installed inside the humidifier washer and the other equipment in the old building. The humidifier is rated at 40,000 c.f.m., with a maximum air velocity of 500 f.p.m. The following guarantee was contained in the specifications: "To maintain 3.6 grains of moisture per cubic foot of air during the winter and at such other times when 525 g.p.m. of water is supplied at 40°. This moisture content will give a relative humidity of 45% at 70° dry-bulb temperature." If the proper thermostats and humidistats are satisfied, recirculated or fresh air may be by-passed inside the washer without going through the sprays.

Steam is supplied to the primary and secondary heaters direct from the boilers at 10-lb. pressure and condensate is returned to an accumulator tank in the fan room. Eleven hundred and ninety-six square feet of radiation are provided in the primary cast-iron heaters located in front of the air filter. Behind the humidifier the single chamber is divided into two ducts supplying the two main supply fans. Nine hundred and forty-eight square feet of area is provided by the six indirect heaters in the supply to fan S-1, and 1188 sq. ft. by the six secondary units in the supply to fan S-2. Immediately behind these secondary heaters are the mixing dampers and sets of automatic-control dampers. Fan S-1 has a capacity of 22,000 c.f.m. and supplies the split system, while fan S-2, of 18,000-c.f.m. capacity, feeds the hot blast system on the first floor. It will be noted that fan S-1, while having less secondary heater area for the larger fan capacity as compared with S-2, has this lack made up by the direct radiators in each room.

Air Filter

Included in the equipment is a 40,000-c.f.m. air filter of the constant effect type in which the filtering medium is an endless articulated screen passing through a reservoir of viscous fluid at the base. The screen is rotated by a geared ¼-hp. motor and is so timed by an automatic clock that it moves one-sixth of its length each 24 hr. An automatic sediment ejector in the base is also driven by the screen motor. The oil film clinging to the screen as it emerges from the reservoir traps dust and dirt in the air and then precipitates it into the fluid when that section again reaches the tank. The filter is placed between the primary heaters and air washer so as to refilter the recirculated air.

Control System

Apparatus in the fan room is controlled by air motors under a constant pressure of 20 lb. This system was selected for its sensitivity, flexibility, and certainty of operation. However, dampers and valves in other parts of the buildings are regulated electrically. Humidifier controls are designed to maintain a constant relative humidity in the treated rooms of 45% at 70° dry bulb.

Fresh air is admitted through two sets of sectional automatic control dampers with a total area of 64 sq.

ft. The sets are divided into three units, as follows: (A) totals one-quarter of the intake area, (B) one-quarter area, and (C) the remaining one-half area. Section (A) operates with the humidifier control switch so as to open when the system is in use. H-1, a return air humidistat, senses the humidity in the return air; on rising humidity it closes the recirculating dampers, opens unit (B) of the fresh air dampers, and opens the outboard dampers on the main exhaust fans V1 and V2 at the top of the recirculating riser. Thus, a perfect balance of conditions is given at all times. On a continued rise of humidity above the desired maximum, the humidistat opens unit (C) of the fresh air dampers until humidity conditions are satisfied.

A cold air thermostat, T-3, in the fresh air chamber opens the valve in the steam line to the first stack of preheaters when outside temperature falls below 36°. The return air thermostat, T-2, in the recirculating duct, senses the dry-bulb temperature of return air and acts so that when the final temperature in the primary mixing chamber is below 55° steam is supplied to the second stack of primary heaters in order that the proper relative humidity may be obtained by heating the spray water. This thermostat at present also operates a pneumatic water valve controlling the amount of water to be sprayed.

Provision is made for future connection of refrigerating machinery. A reverse-acting thermostat in the same chamber will operate the upper part of a V-port modulating valve, in turn acting on a three-way mixing valve in the discharge line of the water pump which will automatically regulate the temperature of the humidifier spray water.

A diffostat between the humidifier and reheater will operate a thermostat controlling the lower half of the V-port modulating air valve, thereby fixing a constant pressure on both sides of the valve; a change in temperature will affect the pressure and thus regulate the quantity of humidifier spray water. When the three-way mixing valve is entirely closed, the water pump will stop automatically.

T-1, a dew-point thermostat in eliminator chamber of the humidifier operates valves supplying steam to second stack of preheaters on falling wet-bulb temperature.

Supply air thermostats T-4 and T-5 in the discharge ducts of main supply fans S-2 and S-1 operate to close the mixing dampers before and after the reheaters and open the by-pass dampers under reheaters upon rising temperatures. Interconnected on the fan inlets are automatic shut-off dampers which close when the current to the fans is off.

Thermostats T-4 and T-5 control a weather compensator which enables the system to be operated as follows: summer, winter, mid-season, and close. Installed adjacent to each thermostat is a pneumatically-operated cut-over switch in turn controlled from a hand-operated four-way selector switch located on the main panel board. The compensator for fan S-2, supplying the hot blast system, operates so that when the outside temperature is 0°, air delivered to the galleries shall be 80°; at 65° outside temperature air to the galleries shall be 70°. The compensator automatically controls this difference by raising the supply air temperature in accordance with the outside temperature drop. The control for fan S-1 is fixed at 65° constant temperature.

Fuel Consumption

Fuel consumption in the coldest periods of the past winter has been about 500 gal. of oil per day for the combined heating loads of both buildings, which compares very favorably with a heating season average of 260 gal. per day consumed by the old equipment in heating the original building.

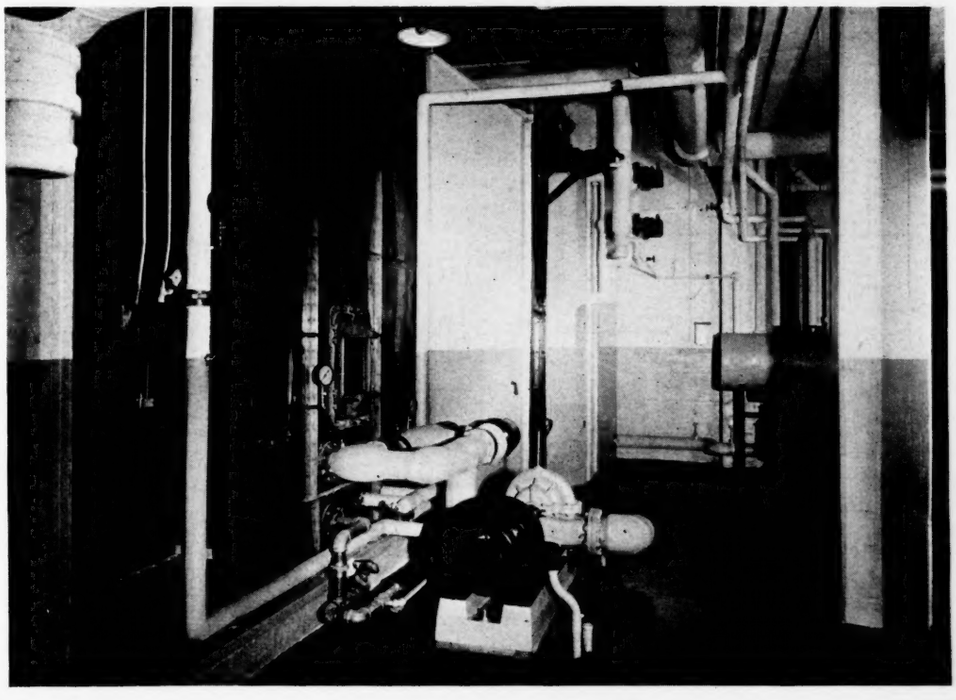


Fig. 5. Apparatus room. Extreme left shows the access door to the secondary heaters. In the extreme rear may be seen the primary heaters, with the air filters and air washer between the primary and secondary heaters. Overhead is seen the recirculating duct.

Operating Data on Steam Jet Refrigeration for Air Conditioning

STEAM ejector refrigeration for air cooling has come along rapidly since its introduction within the past year or two, especially in fairly large units. Little information as to the operating results has come to light though, for many of the installations have not been in use long enough to permit gathering good data. The Research Committee of the National District Heating Association at its meeting in June presented some facts about the operation of three of these plants—one in Chicago, one in New York, and one in Detroit. The following cases are from the report.

CASE 1
MAURICE'S RESTAURANT

Location of unit	Chicago, Ill.
Size of unit	27 tons
Nature of business	Restaurant
Volume cooled	26,000 cu. ft.
Seating capacity	250 people
Method of cooling air	Unit coolers
Initial steam pressure	100 lb. gauge
Hr. operation per day	5
Air circulated	8,000 c.f.m.

Operating Data

Water required for condenser (full load)	780 g.p.m.
Steam requirements (full load)	950 lb. per hr.

Approximate Steam Requirements

June	71,000 lb.
July	149,000 lb.
August	180,000 lb.
September	133,000 lb.

CASE 2
KIPS BAY STATION OF NEW YORK STEAM CORPORATION

Location—test laboratory	New York, N. Y.
Size of unit	25 tons

Test Data

Duration of Test	15 min.
Condenser water temperature (inlet)	74°
(Outlet)	91°
(Inlet)	60°
Refrigerant water temperature (outlet)	45°
Refrigerant water flow	50.5 g.p.m.
Steam used	1,064 lb. per hr.
Flash in evaporation	367 lb. per hr.
Lb. motive steam per lb. flash steam	2.9
Per cent flash	1.45
Temp. in flash and steam cond. weighed	89°
Steam pressure to nozzle	102 lb. per sq. in. gauge
Vacuum in flash chamber	29.699 in. Hg.
Refrigeration produced	31.6 tons
Motive steam per ton refrigeration	33.7 lb. per hr.

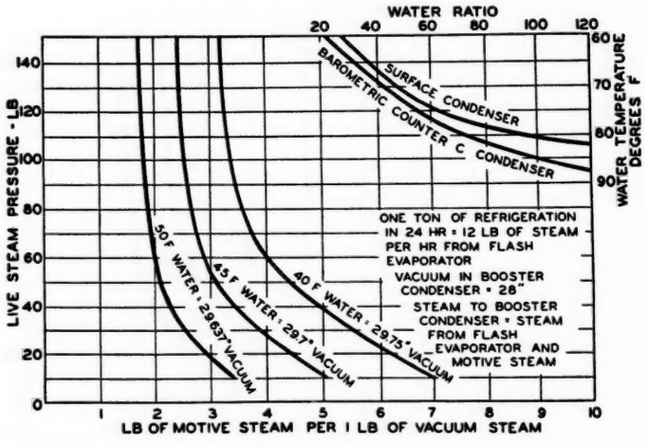

WATER RATIO
20 40 60 80 100 120
LIVE STEAM PRESSURE - LB
140 120 100 80 60 40 20 0
WATER TEMPERATURE DEGREES F
60 70 80 90
SURFACE CONDENSER
BAROMETRIC COUNTER C CONDENSER
ONE TON OF REFRIGERATION IN 24 HR = 12 LB OF STEAM PER HR FROM FLASH EVAPORATOR
VACUUM IN BOOSTER CONDENSER = 28"
STEAM TO BOOSTER CONDENSER = STEAM FROM FLASH EVAPORATOR AND MOTIVE STEAM
50 F WATER = 29.63" VACUUM
45 F WATER = 29.7" VACUUM
40 F WATER = 29.75" VACUUM
1 2 3 4 5 6 7 8 9 10
LB OF MOTIVE STEAM PER 1 LB OF VACUUM STEAM

Fig. 1. Entrainment ratio of vacuum boosters for refrigeration units

CASE 3
SNYDER'S RESTAURANT

Location	Detroit, Mich.
Size of unit	14 ton
Space requirement of unit	10 ft. x 2½ ft. x 7½ ft. high
Nature of business	Restaurant
Volume cooled	26,000 cu. ft.
Seating capacity of restaurant	177 people
Method of cooling air	cooling coils
Per cent of air recirculated	30%
Initial steam pressure	31 lb. gauge
Business hr.	6 a.m. to 9 p.m.

Test Data

Date of test	September 15, 1932
Duration of test	15 hr.
Hr. continuous operation of unit	10 hr.
Average outside temperature	78.5°
Average inside temperature	75.8°
Maximum outside temperature	84.4°
Maximum inside temperature	79.2°
Steam used	4,747 lb.
Electricity used by refrigerant water pump	22.7 kw-hr.
Temperature of city water entering condenser	72°
Temperature of city water leaving condenser	97°
Average temperature of refrigerant water leaving unit	47.2°
Average temperature of refrigerant water entering unit	51.7°
Average cooling load for 10-hr. period	13.79 tons

In commenting on the situation the report states that:

"It was impossible to make a heat balance because the water meter for the condensing water did not register correctly. The cooling load was calculated from the quantity and temperature rise of the refrigerant water.

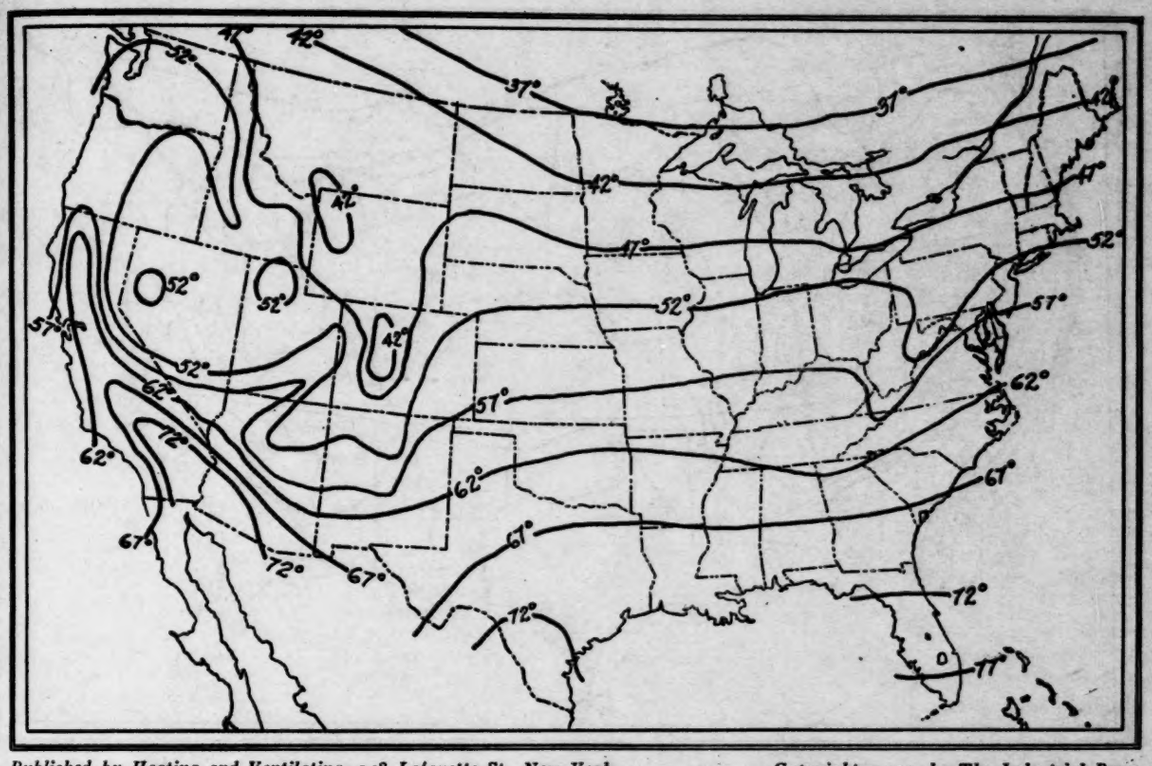
"Comparatively little operating data is available on steam ejector units at this time. It can readily be seen that local conditions such as steam pressure, condenser water temperature, temperature of refrigerant required and service-seasonal load factor, as well as cost of steam and water will require that each unit be designed to suit the individual requirements.

"The general characteristics as to steam and water are shown . . ." (See Fig. 1).

It will be noted that the results obtained are from short-period tests for the most part and that the reports are not in uniform terms. The data are thus preliminary and by no means complete but they are interesting in showing what operating results may reasonably be when more complete reports are possible.

Several thousand tons of steam refrigeration machinery are reported as installed for air conditioning purposes. These range from New York to New Orleans, and in size from 10 tons to 300 tons, although standard sizes available are from 2 tons to 400 tons per unit. Any steam pressure from atmospheric up may be used.

WELL WATER TEMPERATURES



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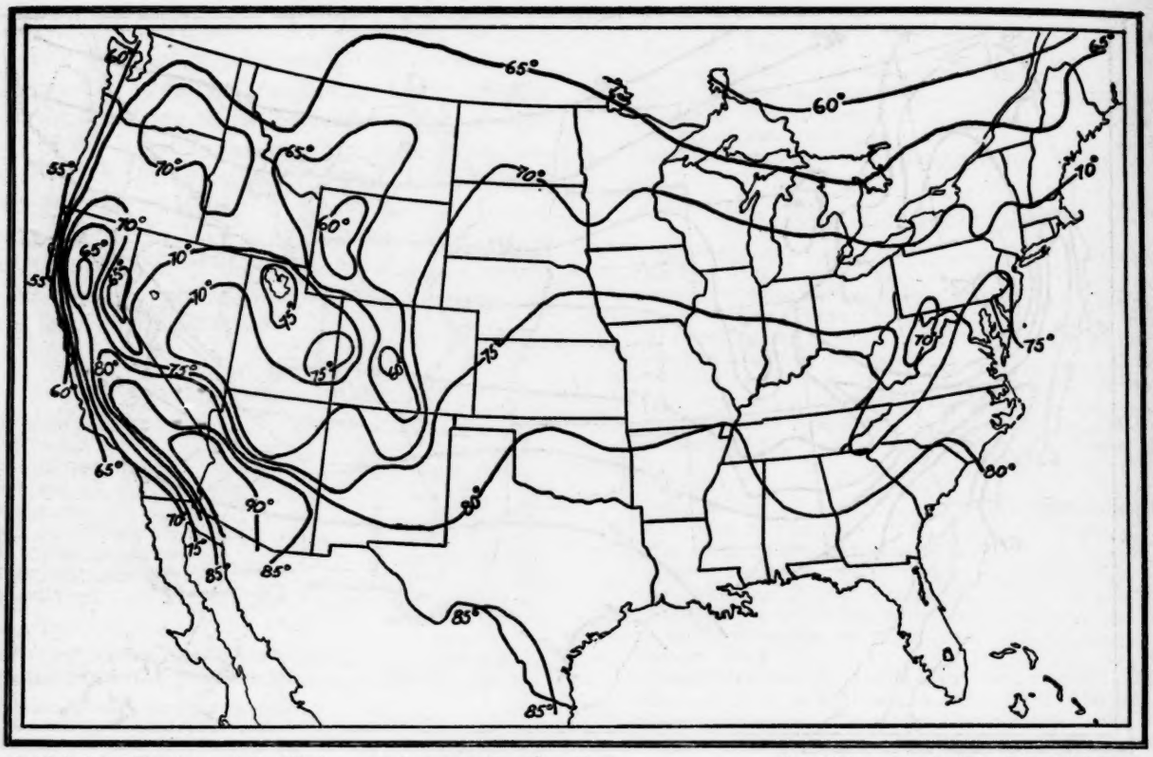
It is often necessary for the air conditioning engineer to know the temperature of surface and well water available in various localities when specifying or designing condensers and cooling equipment. This information is presented in the accompanying charts from Water Supply Paper 520, published by the United States Geological Survey, Department of the Interior, Washington, D. C.

The above map shows the probable temperature of well water at depths of 20 ft. to 60 ft. in the United States. It has been found that, at depths of 30 ft. and greater, the annual seasonal range of temperature of well water does not exceed 1°.

From a study of over 3000 records of ground water temperatures, one observer, C. E. Van Ostrand, has concluded that under normal conditions the temperature of ground water obtained at a depth of from 30 ft. to 60 ft. will generally exceed by 2° or 3° the mean annual air temperature for the locality, with exceptional cases slightly greater. The British Association for the Advancement of Science has adopted as most probable an average increase in temperature of 1° for each 64 ft. of depth. It may be stated that for practical purposes water taken from depths of 20 ft. to 200 ft. will have a uniform temperature of from 3° to 6° higher than the mean annual air temperature.

SURFACE WATER TEMPERATURES



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The above map, showing the normal mean monthly temperature for July in various locations in the United States, provides a basis for estimating the probable maximum surface water temperatures for these locations. It has been shown that during the warm months the mean monthly surface water temperature is generally within 3° above or below the mean monthly air temperature, and that the maximum water temperature is rarely more than 4° above the mean monthly water temperature.

The range in temperature of surface water, while considerable, is much less than the range in air temperature, due to the higher specific heat of water. The minimum surface water temperatures recorded during the cold months will be from 32° to 34°, and the presence of melting ice in the water in the spring may retard the warming up of the water as the season advances. The water in deep lakes and reservoirs will be slower to warm up in the spring and to cool down in the fall than that in shallow ponds and streams.

The Red Square, Moscow, showing Lenin's tomb in the center, and the Kremlin to the right.

A Kaleidoscopic View of European Heating Practice

By RUDOLF KUHLMANN†

I STARTED to Europe last November on a business trip on which I was able to gather some first-hand information about heating and ventilating practices, steel heating boiler manufacturing, and especially the progress of air conditioning installations. As it happened, my plans developed so quickly that there was little chance for advance planning. If I had but known it, the proper procedure is to go at once to Milan and see Charlie Hauss. This charter member of the A.S.H.V.E. can tell you the story of how American heating equipment was first introduced into Europe and, for that matter, into many other parts of the world. Moreover, he'll welcome you, tell you many good stories, and you'll enjoy every minute of your stay.

Then, too, I had no idea in advance how helpful a friend the American engineer will find in our consular service. It was my experience that if an American company will show interest enough in foreign trade to send a representative who can be on the ground, the consul's office will give him the closest cooperation. In many cases, after we had studied the files containing information about local industries and companies, an assistant was sent to spend the whole day or even more, if necessary, to introduce me and act as interpreter at the various firms we had selected. The value of this assistance becomes apparent when you realize there are 31 different countries in Europe, not including Russia, each a political entity, and all striving to become independent economic units. As I look back it seems to me that the deepest impression I got from Europe is the endless variety of the practices, perhaps due to the many nationalities. This variety is likely to be the source of our knottiest problems and also the basis of our most fascinating opportunities in the progress of our industrial relations with

†Engineer, New York, N. Y.

Europe's many countries.

But to get back to my story. Not having been able to make careful plans I went through Gibraltar on the fly and took a long bus ride to Seville, the heart of southern Spain. Here, in the warmest country of Europe, I saw the air conditioned Coliseo Espana Theater, and a bang-up heating job in the American Consulate, both installed according to American plans, the latter by a Spanish heating contractor of German extraction. This is an indication of conditions in Spain, with American influence, German penetration, and an alert interest in air conditioning and its future possibilities.

Italy is on the jump, unceasingly active, headed for the "bigger and better" under a great leader. I was interested here to learn how some of their heating organizations function. One company will install the equipment, supply the fuel, attend to its firing, make all necessary repairs; in short, render a complete service on a yearly fee basis. Such a firm may also manufacture the equipment it uses. This tendency to vertical organization is quite common in Europe.

Switzerland's high altitude and cold winters evidence a need for humidification and I noticed a recently aroused interest in this subject.

Paris is the headquarters for the European activity of American firms. I was told that France was the best market for heating equipment in the world in 1932. Government construction, rehabilitation and a fundamentally more conservative business structure made the depression less severe in France than in most countries. I talked to one boilermaker on the Seine, who was working a night-and-day shift, mostly on government orders. A heating contractor whom I visited, hardly had room enough for his busy draftsmen and confessed that he really had more work than he could handle.

England has its own problems. "We *must* burn coal" is the slogan. They are fighting the use of oil on land and sea. A great deal of money is being spent to develop coal-emulsion equipment for their ships. One stoker manufacturer told me his sales had doubled in 1932 over 1931. England, it seems to me, is being gradually won to the idea of "central heating" and by natural sequence to automatic heating. "Central heating," by the way, is a term applied all through Europe to the ordinary house-heating plant we have here. It does not mean central station heating, but is used evidently to ennoble this installation over the common fireplace and room-stove variety.

The striking characteristic of Holland is the almost total lack of factories and manufacturing facilities. Born to the trader's heritage, the Dutch present a good outlet for the products of other countries. I was told that Belgium has the lowest manufacturing cost for heating equipment in Western Europe.

Germany is the heating pioneer of Europe but is the most backward of all the western European nations in adopting automatic stokers and oil burners for heating. The average German family is quite willing to tend furnace, and in wealthier families it is expected that the maid will do this work.

Here I found the home of the typical coke boilers having a large fuel magazine, either upper front or top firedoor, and with the draft drawing the gases through the fire bed, up the sides, down the sides again in an outer flue, and then out the bottom rear. This type of boiler is to be found generally throughout Europe and may be recognized as the cast-iron Strebel or Buderus-Lollar design. Another feature of boiler design prevalent throughout Europe is the stationary, water-cooled grate. Shaking grates seem a decided rarity in these countries. (See illustration, page 30.)

The extreme rigidity of German patent regulations is traditional, but what is little appreciated is that a yearly tax on the patentee is graduated upward so that in the latter years a patent becomes a real burden unless it can be profitably used. If one discontinues tax payments the patent becomes common property.

While comparing notes with one German steel boiler manufacturer, he told me that it was his custom to add 100% to the direct labor cost to arrive at overhead, then he added 15% as profit to the total of material, labor, and overhead to give him his selling price. In 1932, he said he was glad to get overhead and pass up the profit. Let our own boilermakers and cost accountants get what comfort they may from this.

Czecho-Slovakia is striving hard to build a well-rounded nation. During my visit I found an intense interest in brown coal (lignite) boilers to utilize the extensive deposits of this fuel to be found within its borders. Brown coal is already widely used in Germany and Austria. In Prague, some splendid industrial air conditioning jobs have recently been installed.

Poland shows very strongly the influence of German heating pioneering, although with the present feeling between the two countries the Poles are reaching to Danish patents and other sources. In many industrial firms the government holds a partial stock ownership. Business mortality has been high here.

As I passed under the double-masted portal marking the Russian boundary, picketed with Red Army soldiers with their peculiarly spear-pointed woolen caps, I felt I was reaching the most interesting part of my trip. And so it was.

All business in Russia is government business, and Moscow is its headquarters. For five days I tramped the streets from Leninskaya Sloboda to Semyanovsky Zastava at opposite poles from central Kremlin, trying to find the man with the right authority for the business I had in hand. If you can conceive of each of our cabinet members being given the title of Commissar and acting as Chairman of the Board for all the companies in his division of the industrial field, and realize that he draws his power wholly from political strength, then visualize that there are three controlling forces in each company, or trust, as they call it in Russia, viz.,

the Technical Director, the Party (Communist) Director and the Labor Union Head, you can realize how different are the lines of authority compared to our own.

On the train I met an English cotton expert who wanted a job in Moscow. He got one very easily, and so it was generally. There was work for everyone—and more. Of course, you had to be content with the going rate of pay in Russian (paper) rubles. In 1932, the spread between the pay of the various industrial workers was about as follows. The worker with technical training might get 75% more than the machine operator, the engineer 125% more, and director of a trust about 250% above the operator. I was told that this spread represented an increase during the last few years.

One day I went into the old stock exchange building, now the Chamber of Commerce on Ilyinka Ulitza. As usual I headed for the basement, where I found steel-welded boilers of the Cornish (Mazhuga) type equipped with oil burners quite similar to one of our American makes. After talking sign language with the fireman for a while, I gathered that he was in some kind of trouble so finally he took me upstairs to the director, who could speak a broken German of which my knowledge, too, was limited. The system was forced hot water, as is common throughout all Europe, and one of the pipes had frozen. What to do? Could I help? My suggestion of running a parallel pipe, since a good part of the existing pipe was inaccessible, met vehement objections. Did I realize that pipe was as scarce as bath-tubs? I ultimately worked out a couple of possible thawing methods and left with their sincere thanks, despite my telling them that the pipe was probably already cracked.

Steel tubes are likewise at a premium in Russia. The designer in one plant told me that some time ago he had been instructed to eliminate all boilers with tubes and redesign where necessary to avoid their use.

There are 11 large apartment buildings in one group in Moscow out near Semyanava Zastava and known as the 1905 Cooperative. All are heated by a central battery of 10 steel-welded boilers of Cornish (Mazhuga) type, fired by coal, (semi-bituminous from the Donetz basin) supplying a forced hot water system. Each boiler is of riveted construction and has 410 sq. ft. of heating surface, being approximately 4 ft. in diameter and 20 ft. long, and set in brick.

Even though food production was the great problem last year, some new industrial plants were being built. The heating trust BOKO (Voko) was equipping a large cast-iron boiler and radiator factory seven miles out of Moscow, to make boilers of the Strebel (German) type.

Russia is a country which sees no need for salesmen and where advertising is a lost art. How would we fare without our sales literature?

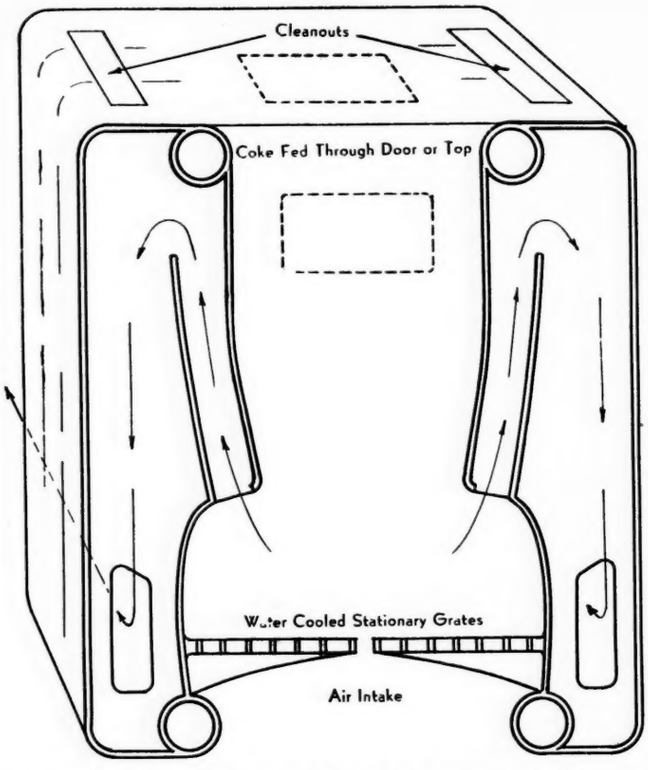
Purely from hearsay evidence I was able to collect a rather startling comparison of labor and material costs throughout Europe. The hourly rate paid to electric welders in England was about 65% of ours, in Switzerland 55%, in France 40%, in Germany 33 1/3%, in Spain, Belgium, and Italy 25%, and in Russia 5% of our own, based on par exchange. I was told that welders in France were probably 80% as efficient as ours and in Spain considerably less. The cost of steel sheets in all these countries ran remarkably close to American prices, the maximum variation being not more than 20%, with the exception of Russia, where the summer rate was about 50% over ours and the winter cost about 300% above, because in winter boat shipment from Germany was impossible and rail movement involving the high Polish duty was necessary.

Throughout all of southern Europe you must bear in mind that the big majority of heating installations are in stores, public buildings, schools, etc. Residential installations are few and far between. In England this is also very nearly true, but in France, Germany, and Switzerland there is almost as much residential heating proportionally as in our own country. As for air conditioning as we know it, there are but few installations and these mostly in theaters and industrial applications.

One trend that is decidedly apparent in most of the countries of Europe is the spread of government influence in business. In Poland, one of the largest industrial companies, comparable to our U. S. Steel Corporation, and which, by the way, started two years ago to manufacture heating boilers, is 50% owned by the Polish government. In Germany, many of the industrial concerns are controlled by the government, including the United Steel Works, the largest steel combine in Europe and also a boiler manufacturer. I was told in Italy that Mussolini was taking steps to prohibit the foreign ownership of majority stock in any Italian company. In France, the stock exchange members are appointed by the Minister of Finance. In England and Germany the governments have guaranteed the payments on sales by their nationals to Russia. And of course, in Russia all business is 100% governmentalized. Perhaps we shall not be far in the rear in this movement.

But the outstanding economic tendency affecting most powerfully the relations among nations today is the effort to achieve economic nationalism or, let us say, "self-sufficient isolation." English companies, for instance, helped by the depreciation of the pound sterling in 1932, started to manufacture their own automatic controls, produce their own oil burners, and are now making domestic stokers. Unfortunately for American firms these products are made by the same companies who formerly purchased American products and in some instances not only the same design is used, but the identical name, trade marks, etc.

Most of our companies with foreign interests are doing some solid thinking on this problem of "national isolation." Broadly, there are



Arrows show paths of products of combustion through the typical coke-burning European boiler

three general modes of industrial relations among nations.

First, we may export the products of our factories here in America to foreign countries. A second policy has been to organize subsidiaries abroad to build factories there and develop local selling organizations. A third plan is based on "engineering service contracts" between our industrials and foreign concerns.

High tariffs and exchange difficulties are effective tools of economic nationalism aimed to destroy the actual shipment of products required by method one.

Even though the factories are located abroad in the respective countries, there is strong prejudice against the American ownership, and this fact is always widely advertised by wholly national competitors. Prohibitions against foreign controlling interests and actual government ownership of industrials likewise adversely affect this way of doing business.

There remains method three, and many American companies are coming to believe that this will become the most feasible way of maintaining economic relations with the rest of the world. At first thought, the interchange of engineering information may seem to rest largely on patent licensing agreements. However, this is not the essential feature of the "engineering service contract." The practical fact is that patent rights are sometimes hard to enforce in foreign countries, substantially impossible, I am told, in Japan, and naturally not even to be considered in a Communist country.

But if America can keep its preeminence in engineering developments (and I think we can safely claim this in most branches of the air conditioning industry) then we can render a continuing service to the companies of other countries under "engineering service contracts." This plan has the advantage that the payment runs contemporaneously with the benefit.

Manufacturers in this country have repeatedly had the experience of shipping one unit abroad, only to have it studiously copied and business relations forthwith severed. This happens because the foreign purchaser feels we only want to export our products, and it is that or nothing. The resulting economic waste is very great, for these foreign companies have found that they must go through all the development expense our manufacturers have had, and have discovered that the mere copying of a product is but the smallest part of insuring satisfactory field operation. It is to be expected that in many lines, foreign companies would make developments we could use. So the arrangement would eventually be mutual.

One example of this sort of "engineering service contract" which is world-wide in its scope is the method by which an English concern has introduced panel heating in many foreign countries.

It is well known that England has for many years secured a handsome income from the export, if you will, of "financial service." In the same way, the channels of international industrial communication may in future be kept open through the exchange of "engineering service." If products do not move between countries, then the necessity for broader engineering interchange becomes even more vital if we wish to reduce the world's economic waste to a minimum.

Who Originated the Term "B.t.u."?

WHAT is the origin of the term "British thermal unit?"

No one knows, it appears, not even gas engineers, and they have been making and selling B.t.u.'s in this country since 1816, and in England since 1812.

Joseph A. Conforti, assistant librarian of The Peoples Gas Light & Coke Company, Chicago, reported to the convention of the American Gas Association that several years' effort to trace the origin of British thermal unit had met with failure.

Having exhausted all sources in this country, Mr. Conforti turned to the British Museum, the Institution of Heating and Ventilating Engineers, and others.

The only encouraging information he received from these investigations was that British thermal unit was used in a legal document as early as 1820, and that it has gradually evolved from the time Lavoisier and Laplace, in their experiments, adopted a heat unit as a quantity of heat applied to a gramme of ice to convert it into water at freezing point. Later the large calorie, or heat required to raise 1 kg. of water 1° C. was adopted. In England the unit of heat was applied to 1 lb. of water raised 1° F., as it is today in all English-speaking countries.

But who first used the term or how it came into being must be left a matter of conjecture.

Principal Parts of Boiler and Radiator Code Approved by Advisory Boards

THE public hearing on the code of fair competition proposed for the cast-iron boiler and cast-iron radiator industry, held at the Carlton Hotel, Washington, October 24, was concluded shortly after 11 a.m., with Assistant Deputy Administrator B. S. King commending the code committee for its cooperation and Edwin W. Smith, chairman of the committee, expressing appreciation of the manner in which consideration of the code has been expedited.

As chairman of the code committee of the industry, Mr. Smith formally presented the code as revised and briefly outlined the history of the industry. While the code was filed by the Institute of Boiler and Radiator Manufacturers, he stated, it was formulated in a general meeting to which every manufacturer was invited and represents approximately 95% of the industry's production.

The Institute, the speaker said, has been in existence for 16 years and has functioned over this period with regard to affairs of the industry. The industry itself, he added, is about 80 years old and its members are happy to know that the industry contributes materially to the comfort and progress of civilization.

Mr. Smith concluded his remarks by saying that the industry feels that the code embodies a full expression of its desire to help to the extent of available resources in carrying out the aims and purposes of the National Industrial Recovery Act. He said that the effort had been to draft a code that would be fair to all elements in the industry, both large and small.

The code, prepared by a committee composed of E. W. Smith, chairman, The H. B. Smith Company; M. J. Beirn, American Radiator Company; H. T. Richardson, Richardson & Boynton Company; J. F. McIntire, U. S. Radiator Corporation, and R. S. Waters, National Radiator Corporation, provides for a maximum work week of 40 hr., with the proviso that during any 12-week period within the year the maximum may be extended to 48 hr. in any one week. There are the usual exemptions of executives, executive staffs, supervisory and sales forces, employees engaged on emergency maintenance and repair work, etc. Office employees receiving less than $35 per week would average 40 hr. per week over a six-months period, but work not more than 48 hr. in any one week.

A minimum wage of 40 cents per hour is proposed in the code, learners and apprentices to receive not less than 80% of this minimum. F. W. Herendeen, secretary of the Institute, offered an amendment, however, fixing the minimum wage rate for the southern states at 30 cents per hour. The minimum proposed for office employees ranges from $15 per week in cities over 500,000 population to $14 per week in communities under 250,000 population. No minor under the age of 16 may be employed in the industry and no one under 18 years in any hazardous foundry operation.

Chester A. Sample of the Metal Trades Department of the American Federation of Labor objected to the proposed maximum hours and minimum wages. He declared that a 30-hr. week of five 6-hr. days is necessary if any substantial number of unemployed persons attached to the industry are to be reemployed. In September of this year, Mr. Sample stated, employment in the industry was 48.3% of the 1926 figure. In terms of 1929, he added, 40% of the workers have been displaced and 10 years ago employment in the industry was 11% greater than in 1929. Another suggestion of Mr. Sample was that the number of exemptions from the maximum hour provisions of the code be reduced. He said so many exemptions offer loopholes for abuse

NRA hearing on code for the cast-iron boiler and radiator industry, held October 24 in the Carlton Hotel, Washington D. C.

or evasion. He suggested a 35-hr. week for office employees.

Mr. Sample declared there is no justification for the lower minimum proposed for learners. He added that with so many experienced men out of work there is no warrant for training new apprentices.

He urged a minimum wage for office workers of $16 per week, pointing out that this would be substantially below the average for all industrial groups in the past.

Mr. Sample also urged that provision be made for protecting employees whose wages are now above the minimum. He likewise declared that the so-called "merit clause" should be eliminated from the code.

Charles W. Wilkerson, labor adviser, supported the brief of Mr. Sample, especially urging the elimination of the "merit clause."

G. W. Day, representing a group of wholesalers, stated he desired to file a brief pointing out objections to the section which defines wholesale purchasers.

M. W. Dennison, representing another interested group, likewise requested permission to file a brief.

Fred E. Huhlein, representing the Consumers Advisory Board, took strong exceptions to the provisions which he declared seek to control resale prices. He declared that the Board is definitely opposed to the fixing of resale prices and announced he would file a brief covering the subject more in detail.

Deputy King, in reply to questions stated that the code committee would have an opportunity to submit a brief in reply to that of the Consumers Advisory Board. He also announced that tentative approval of the greater part of the code has already been received from the several advisory boards of the NRA.

On behalf of the Heating, Piping and Air Conditioning Contractors National Association, Joseph C. Fitts filed a letter objecting to the code provision which classifies Federal, State, and local governments as contractors. He contended that there was no reason for so classifying these government agencies. He also felt that it was undesirable to include definitions of mail order houses, direct-to-you, and retailer groups.

Immediately before declaring the hearing recessed subject to possible call by the Administrator, Deputy King invited Mr. Smith and other members of the code committee to confer with him in his office in the afternoon.

Wage Differential Question Raised at Furnace Makers' Code Hearing

AN extended statement intended to justify the wage differential in favor of the South and the presentation of detailed objections of labor to the proposed code occupied much of the time at the public hearing on the code of fair competition for the warm-air furnace manufacturing industry, held in the Caucus Room, New House Office Building, Washington, D. C. Deputy Administrator B. S. King presided.

The code was formally presented by W. L. McGrath, chairman of the Code Committee of the Warm Air Furnace Manufacturers Institute. He also outlined conditions in the industry, calling attention among other things to the serious mortality of manufacturers which has taken place in the last four or five years.

The proposed code set up the minimum rate of 40 cents per hour in the North and 25 cents in the South. Maximum hours were set at 40 per week, with exceptions permitting 48 hr. at designated times. Employment of persons under 16 years of age is prohibited and an amendment proposed by the chairman of the code committee stated that preference in employment is to be given to citizens.

Inclusion of the differential of wages brought forth an objection from W. A. Calvin of the American Federation of Labor. It was his belief that the 15 cents differential between North and South was in no wise justified. Moreover, he thought that the minimum wage of 40 cents was entirely inadequate. He introduced figures tending to prove that this rate is less than that currently paid. He also offered the usual labor proposal to the effect that the maximum hours of work should be set at 30 per week. He contended that his proposal would not unduly raise the cost and that, unless adopted, employment would not be increased to a satisfactory extent. He offered detailed proposals for rewording the code in such a way that the entire sections on wages and hours would be substantially rewritten if his proposals were adopted.

Elimination of the wage differential led to objections on the part of C. Ackerson, who stated that he represented the southern branch of the manufacturing interests. In an extended statement he contended that because of the lower cost of living and the economic necessity of the manufacturer, the differential in the wage rate was entirely justified. He cited conditions in the industry to back up his contention, pointing out that other manufacturing groups have been permitted a wage rate in the South equal to that which he was advocating. He stated that at persent the prevailing wage rate in the vicinity of his own plant was approximately 25 cents per hour. He felt that the question of differentials should be determined for each industry separately and denied that the low rate in the South was due to the use of negro labor.

In response to questioning by Deputy King, Mr. Ackerson stated that there are four manufacturing plants of this kind in the South, and further questioning brought forth the information that from 5% to

10% of the products in the industry are manufactured in this section. Mr. Ackerson maintained that refusal of a substantial differential would mean that the manufacture of warm-air furnaces could not be carried on in the South.

Chester A. Sample of the International Molders Union was also in favor of a 30-hr. week and proposed that molders and coremakers should be paid $38 per week. Laborers' wages, in his belief, should be set at not less than $25 per week.

R. Martini, a representative of the Consumers Advisory Board, NRA, objected to the inclusion of any wording which would permit price maintenance. As such a proposal was included in one section of the code he felt that it should be removed. H. T. Richardson stated that the phrasing was to protect the jobbers and that the provision had been inserted in their interests and not in the interests of the manufacturer.

Mr. Calvin proposed that administration of the code should be so set up that both employees and employers would be represented on the governing body. He wanted to provide a joint standing committee composed equally of representatives of the Association and labor interests. He also asked to be permitted to present a brief on the subject of the wage differential in the South.

Deputy King in calling a recess asked for a meeting of the committee and the NRA advisors in his office in order that questions might be further discussed. He expressed his appreciation of the work done by the committee and his confidence that a helpful code would be forthcoming.

Building Trades Unions Show Opposition

THROUGHOUT the hearings on the construction codes the labor representatives have objected to the 40 cent per hour minimum wage and to the 40 hr. to 48 hr. work week. They have proposed a 30-hr. week and a 40 to 50 cent minimum wage. They have also proposed that labor be represented on the administrative bodies. Proposals that they accept temporary reductions in wage scales have also been opposed.

Late in the month the organized labor groups in the building industry indicated that nothing but a strike could be expected if the code as proposed by the Construction League were approved as it stands. They moved in a body and with William Green as their spokesman in an effort to force revisions in the Construction League code according to their ideas.

An alternate code was drawn up. It proposes to separate building construction from the blanket construction coverage of the League code; writes in labor's ideas about wages and hours, and provides for labor representation on the Code Authority with a number equal to those representing employers.

There seems to be no doubt but that organized labor is expecting to offer determined resistance to the League code. Just how far it will get is problematical. With the building industry so highly unionized, determined resistance on the part of labor can easily upset any immediate recovery in construction volume and NRA can be expected to weigh its protests carefully.

Public Health Engineer Studies Industrial Dust

THE effects of drawing air into an open duct or hood differ vastly from those of blowing out the same air, according to J. M. Dallavalle, assistant sanitary engineer, U. S. Public Health Service, Washington. Mr. Dallavalle, in his paper "The Control of Industrial Dust," presented before the last semi-annual meeting of the A.S.M.E., discussed the nature of air flow into exhaust hoods, and the velocities required to set dust in motion and effectively entrain it.

When the air is discharged from a nozzle, the stream is sharply defined and intact for some distance from the opening. When air is drawn in, however, it moves toward the opening from all directions and the velocities are therefore much reduced, even at a short distance from the entrance. Actual measurement shows the velocity at a point 1 in. outward along the axis of a duct 4 in. in diameter to be approximately one-half of what it is within the duct itself.

An especially designed pitot tube has been used to plot contours of equal velocities in any axial plane located in the field of influence of any duct intake. The positions of these contours for any hood can be expressed as percentages of the velocity at the hood opening, and are purely functions of the shape of the hood. These velocity contours are identical for similar hood shapes when reduced to the same basis of comparison. These facts represent an important aid in the solution of exhaust hood design problems in estimating the volume of air required to control a given dust source. It is noted that the velocities with which the air flows into the hood are seriously affected by the shape of obstructions at the entrance to the hood.

With respect to general ventilation for dust control, it is stated that numerous complications arise from consideration of such factors as local conditions affecting distribution of air movements and heat losses during winter months. It is recommended that where this method is to be followed, a sanitary and occupational survey be conducted to determine points of local dust concentration. Thus, local exhaust methods can be utilized at these points to reduce the volume of dust distributed by the general ventilating system.

EDITORIALS

Building Codes

IN a recent bulletin of the American Standards Association able writers have summarized the building code situation as it now exists. They call attention to the large number of cities which now have codes of some form or other based primarily on the exercise of local police power to make building safe. While the number itself is impressive, the point of overshadowing importance is that in writing codes of this kind it is now well recognized that there should be no mere listing of approved materials or equipment but that they should state the results desired and leave the materials and methods open to development. This is the only fair and sane method of writing such codes where it can possibly be done. To do anything else is simply to shackle progress for, as one of the writers mentions, the average revision period in many cities is seven years. Plenty of developments take place in such a period.

The fact which prevents the application of the principle in some cases is the lack of information which will permit writing into a code a statement of the results desired in measurable terms. Where this lack exists it would seem much more logical to develop such terms rather than to spend effort in drawing up a lot of detailed specifications to block progress. Unfortunately, too many alleged codes still do not recognize this condition of affairs. Results are what are important under codes, not the details of how the results are accomplished.

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Steam Cooling Forges Ahead

ONE of the surprises of the current year has been the ready acceptance which steam refrigeration has found. Even in an off year in building construction the tonnage of this type of refrigeration which has been installed is beyond expectation. On air conditioning work where large size units are required this method of producing chilled water has much to commend it and engineers have been quick to recognize this fact.

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Financing of Building

RECENT events have brought out as nothing has done in a long time the absolute necessity of an active building construction industry if there is to be any substantial recovery in business. All authorities seem agreed that one of the checks on recovery has been the absence of a sizeable demand for capital goods, and that the construction of buildings is an ideal source of such a demand. As this has been increasingly realized so has there been an increasing consideration of means of stimulating building. Suggestions of government-financing and public construction in several forms have been advanced. It is discouraging that so far these suggestions have not become concrete to an extent to call for any enthusiasm. The encouraging feature is that the need is definitely realized to a greater extent than ever before. When the problem is thoroughly outlined the solution is often half at hand. As publicly-promoted construction looks like the only kind that is likely to materialize in any volume for some time, there is reason to take renewed hope that tangible plans will be forthcoming soon.

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A Good Name vs. Price Cutting

NRA codes are just getting into operation in our industry with more to come. Speculation is already starting in attempts to predict how they will affect the conduct of business. If they are even partially successful, it is evident that they will put a stop to many of the unfair practices in which everyone has suspected his competitor of indulging. With these eliminated, competition should be on a higher plane but no less vigorous. There is going to be a premium on good management and good products honestly priced and ethically sold. Reputation will count for something tangible. As nothing is more effective in building a good reputation than well written and well planned advertising, it can be predicted safely that advertising will play a role of increasing importance in the new plans of business.

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Public Building Modernizing

THE over-three-billion public works fund is now about two-thirds assigned. At the present rate of making apportionments it will all be allotted before the end of the year. This is a period of only about seven weeks. In view of this fact the stage has now been reached when there is virtually a last call for eligible projects. If you know of a public building whose heating or ventilating plant could well be modernized, there is no time left for delay in trying to get it lined up as an active job. This kind of a job has a just claim for consideration. Don't let one fail to come up if anything you can do will help it. Do your part in getting it going. Engineers, especially, can be helpful in locating these buildings and calling attention to their equipment needs.

Abstracts . . .

**Reviews and Summaries of. . . .
Current Papers, Books and Pamphlets**

Government Issues Bibliography on Air Conditioning

A bibliography of information on air conditioning has been compiled by the Plumbing and Heating Products unit of the Bureau of Foreign and Domestic Commerce, U. S. Department of Commerce, listing trade associations and organizations interested in air conditioning, recent magazine articles on the subject, government reports and other miscellaneous pamphlets and releases on air conditioning.

[*"Bibliography of Information on Air Conditioning." A 29-page mimeographed, letter-size pamphlet; obtainable from the Department of Commerce without charge.*]

●

Handbook on Arc Welding

Encyclopedic in scope, "Procedure Handbook of Arc Welding," recently published by The Lincoln Electric Company, makes available in one volume up-to-date information on design and procedure for electric arc welding. It has been prepared for use of welders, designers, and heads of welding departments.

Welding methods, technique, equipment, procedures, speeds, and costs, weldability of various metals, applications and similar subjects are treated in great detail. Pipe welding receives some attention, particularly where the larger sizes are involved, such as pipe line work.

[*"Procedure Handbook of Arc Welding Design and Practice," published by The Lincoln Electric Co., Cleveland, Ohio; bound in semi-flexible imitation leather, gold embossed;* 434 *pages, with index, about* 500 *illustrations;* 5¾ *in.* × 9 *in.; price* $1.50; *foreign postage,* 35 *cents.*]

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A Comparison of Electricity, Oil, Gas, and Coal as Heating Fuels

In this country A. H. Barker is probably best known for his notable accomplishments in the development of panel heating. His versatility is shown by a recent paper presented before the British electrical engineers on relative fuel economy, a thorough analysis of what is usually a highly controversial subject.

The author begins with a discussion of and tabulations on the crude cost of heat and the known advantages and disadvantages of each of the common fuels. The crude costs are next modified by labor costs to obtain a net fuel cost. These figures are in turn modified by the boiler efficiencies and system efficiencies, finally arriving at a combined efficiency of each fuel. The author brings into the picture the "joint" efficiency, a measure of the excess amount of heat necessary to regulate inside temperatures at the desired point for each of the fuels. Intermittent heating, and daily and weekly diversity factors are considered in some detail as are such phases of heating as warming up a dry building, occupation efficiency and banking. The result is that by evaluating all of these the author arrives at the relative net costs of the competing fuels, and finally reduces the whole mass of data to formulas.

Heat contents, costs, temperatures, and numerous other variables are all, of course, in English units and, consequently, cannot be applied to problems in this country. The method of analyzing the problem, however, seemingly has a number of advantages over methods in use here so that a careful and critical scrutiny of Mr. Barker's paper will well repay American engineers.

[*"The Relative Fuel Economy of Electricity, Gas, Oil, and Solid Fuel as Heating Agents," by A. H. Barker. A paper of The Institution of Electrical Engineers (Great Britain); 25 pages, 5 graphs, and appendix.*]

●

Upward Ventilation Better than Downward for Garages

Few buildings have greater need for ventilation than commercial garages, but on the whole relatively little investigational work has been carried out on this type of building. A year ago Houghten and McDermott made an important contribution to the available literature on this subject, and these same investigators have now published a report on additional studies they have made.

The primary aim of the study was to determine whether their previous findings that upward ventilation is more effective than downward would prevail during the heating season as well as during the milder months. Their conclusions are:

"1—Upward ventilation results in a lower concentration of carbon monoxide at the breathing line and a lower temperature above the breathing line than does downward ventilation, for the same rate of carbon monoxide production, air change and the same temperature at the 30-in. level.

"2—A lower rate of air change and a smaller heating load are required with upward than with downward ventilation.

"3—Upward ventilation results in more uniform temperatures throughout the occupied portion of a building, a condition particularly desirable in a garage where men work close to the floor.

"4—The study indicates that in the average case upward ventilation results in a lower concentration of carbon monoxide in the occupied portion of a garage than is had with complete mixing of the exhaust gases

and the air supplied. However, the variations in concentration from point to point, together with the possible failure of the advantages of upward ventilation to accrue, suggest the basing of garage ventilation on complete mixing and an air change sufficient to dilute the exhaust gases to the allowable concentration of carbon monoxide.

"5—The rate of carbon monoxide production by an idling car is shown to vary from 25 cu. ft. to 50 cu. ft. per hr., with an average rate of 35 cu. ft. per hr. This is in agreement with earlier laboratory studies and the findings of the U. S. Bureau of Mines.

"6—Accepting an average rate of carbon monoxide production of 35 cu. ft. per hr. per idling car, an air change of 350,000 cu. ft. per hr. per idling car is required to keep the carbon monoxide concentration down to one part in 10,000 parts of air."

[*"Carbon Monoxide Distribution in Relation to the Heating and Ventilation of a One-Floor Garage," by F. C. Houghten and Paul McDermott. Presented at the June, 1933, meeting of the A.S.H.V.E.; 5 pages; 7 graphs.*]

●

German Treatise on Heat Transfer

This book may be considered as an expansion of Professor Gröber's earlier book on the fundamentals of conduction and heat transfer, which first appeared in 1921. It is, however, essentially a new book on the subject of heat transfer.

Written in German, the book is divided into three sections: the first treats on the flow of heat in solid bodies. The mode of heat transfer by means of conduction is dealt with analytically, and the derivation of formulas for the solution of the more important engineering problems is carried out. This section further presents a brief analytical discussion of a few of the more important exceptional cases.

The second section treats mainly on the process of heat transfer by convection. This section is broken down into five parts: Flow of Fluids (Hydrodynamics); Flow of Energy; Procedure for Solution of Hydrodynamics Problems; Procedure for Solution of Problems in Heat Transfer; Conduction of Heat in Rarefied Gases. Dimensional analysis is also applied to the solution of problems involved in this section of the book.

The third section is devoted to the subject of radiation of heat energy. After an introductory part, the subject headings of this section are as follows: Black Body Radiation; Radiation between Solid Bodies; Radiation from Gases and Vapors.

An appendix is included which contains useful tables of the more important physical and thermal constants of water, steam, and air. The appendix also contains tables of conversion factors, conveniently arranged and useful for converting units and quantities between the English and metric systems, as well as between physical and engineering systems of measurement.

In general, the entire book is conveniently arranged in a logical manner and the fundamentals are presented with a minimum of detail. Results of the outstanding work of various authorities are covered in the text and frequent references are made to the more important literature on various phases of the processes treated so that detailed reports of work may be easily located for further study. The book was planned primarily for use of the engineer as a manual in his designing work. However, it should also be of value to the student and at the same time should be useful as a reference book for the laboratory worker.—E. C. R.

[*"Die Grundgesetze der Wärmeübertragung," by Dr. Ing. H. Gröber and Dr. Ing. S. Erk. Published by Verlagsbuchhandlung Julius Springer, Linkstrasse 23-24, Berlin W9, Germany; 260 pages; 6½ in. × 9¼ in.; black fabrikoid binding; price 22.50 R.M.*]

●

Transmission of Heat Through Fabrics

Report of research to determine the effect of air permeability and of perforations in fabrics on their thermal insulating properties. Results are expressed in terms indicating percentage of reduction of heat flow resulting from the use of the fabric under specific test conditions. Air permeability and percentage of hole area (light transmission) were determined for all fabrics tested.

Throughout the tests hygroscopic equilibrium was approximately maintained to retard heat transfer by evaporation and condensation. Thermal insulating values were plotted against fabric thickness presenting a series of points lying in a band on either side of a straight line passing above the origin. From the results it appeared to be possible to assign to each group of fabrics a mean excess heat flow above the average, and curves for this excess of heat flow were plotted against air permeability and hole area.

[*Title: "The Transmission of Heat Through Fabrics," by M. C. Marsh, Wool Industries Research Association, Leeds. Published in The Proceedings of the Physical Society, May 1, 1933.*]

●

Booklet on House Insulation for Popular Consumption

Prof. J. D. Hoffman of Purdue University has prepared an instructive booklet entitled "Insulation for House Construction," written to acquaint the layman with the need for insulation, how to insulate, and how to determine what savings would result from insulating. Since the frame house is by far the most numerous in Indiana, Professor Hoffman has confined his discussion largely to that type of house. Numerous drawings show details of construction and application of insulation at points where difficulties are sometimes experienced. In line with the author's discussion of heat saving through insulation, he has included some brief but pertinent material on chimneys.

[*"Insulation for House Construction," by Prof. J. D. Hoffman; 31 pages, 19 drawings; published by the Engineering Extension Dept., Purdue University, Lafayette, Ind. Available to residents of Indiana free, to non-residents, 25 cents.*]

Your Everyday Problems

HEATING AND VENTILATING will be glad to answer your problems relating to installation and operation of heating and ventilating systems. Letters will be answered promptly, and in some cases published anonymously. If sketches are included they should be clearly drawn. Write The Editor, HEATING AND VENTILATING, 148 Lafayette Street, New York.

The following "kink" recently came to our attention, and is passed along here in the hope that it will be useful:

During a prolonged period of severe weather last winter an elbow near the return to the boiler in a hot water heating system in a greenhouse was discovered to be cracked and leaking badly. It was necessary to replace the fitting immediately, but the owner was unwilling to allow the fire to be drawn and the system drained because the greenhouse contained a large collection of highly-prized orchids and other delicate tropical plants.

It was found that the system operated with an open expansion tank, the top of which was located some 19 ft. above the broken elbow, and which was open to the atmosphere only through an overflow pipe. When all was in readiness to make the repair, the fire was banked and a connection was opened in the expansion tank overflow pipe close to where it led off from the tank. Then, with the system filled to the overflow, the overflow was plugged tightly with a pine plug.

The broken elbow was then removed and quickly replaced, the vacuum maintained by the closing of the overflow being sufficient to keep the water from running out of the system while this was being done. As a result, the system was back in operation within a half-hour, and nobody got wet.

This was only possible because the expansion tank in this case happened to be at a low altitude. Had the top of the tank been 25 ft. or 30 ft. above the broken elbow, the supported column of water would have broken and emptied the system, especially since the water in the system was hot at the time the work was done.

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QUESTION 100. *I recently heard the "critical velocity of steam in branch lines" spoken of, and I would like to have you explain just what is meant by this. What is the critical velocity for different sizes of pipe, and how is it determined?* *J. B. M.*

ANSWER: When a steam pipe, approximately horizontal, serves both to deliver steam to a radiator or several radiators, and at the same time conveys the condensation away from the radiators, it will be found that there is a certain definite *critical* velocity of steam flow which, if increased, will interfere with the flow of the condensation, causing it to back up in the pipe in the direction in which the steam is travelling. For example, the radiators of a one-pipe steam heating system are often connected to a riser by a lead-off of considerable length, sloping slightly upward from the riser to the radiator. Under normal operating conditions, the steam will travel along the upper part of the pipe to the radiator, and the condensation will flow back against the steam along the lower portion of the pipe.

If the rate of condensation is greater than normal, increasing the flow of steam, as when a cold radiator is turned on, the velocity of the steam may increase to a value above the critical point, carrying condensation back along the pipe into the radiator and causing the well-known hammering and gurgling noises.

The critical velocity of steam for a given pipe can only be determined through rather elaborate experiments. It has been found, however, that the size of the pipe has no appreciable relationship to the critical velocity in the sizes generally found in heating systems. Likewise, the length of the pipe has no effect on the critical velocity if the slope of the pipe is uniform. For slopes ranging between ⅛ in. and 1 in. in 10 ft., the critical velocity increases rapidly from 500 f.p.m. to 1100 f.p.m., but as the slope increases from this value, the critical velocity increases very slowly, reaching a maximum at about 1350 f.p.m.

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QUESTION 101. *How will the heat transmission rate of a pipe coil indirect heater be affected by the velocity of the air stream? In the case in hand, weighing of the condensation shows that roughly* 67,000 *B.t.u. per hr. are given off by a heater made up of* 1*-in. pipe assembled into cast-iron headers. The air velocity at the face of the heater is about* 300 *f.p.m. What will be the heat transmission if the velocity is stepped up to* 600 *f.p.m. by installation of a more powerful fan.* *C. H. K.*

ANSWER. The heat emission of a pipe coil blast heater is increased when the velocity of the air stream is raised. The heating surfaces are always surrounded by a film of stationary air which acts as insulation retarding the transfer of heat to the air stream, and the more rapid circulation of air through the coils will reduce the thickness of this film. The relationship is given by the formula:

$$K = \frac{1}{0.0447 + \frac{50.66}{V}}$$

in which K is the heat transmission per square feet per hour per degree difference in temperature between the

air and the steam, and V is the velocity of air through the clear area of the heater in feet per minute.

The free area of this type of heater is usually about 25% of the gross area, and the velocity through the free area will be approximately 1200 f.p.m. when the velocity at the face of the heater is 300 f.p.m., and 2400 f.p.m. when the face velocity is 600 f.p.m. The total heat transmitted by the coil will be directly proportional to the values of K at the given velocities.

$$\text{At 300 f.p.m., } K = \frac{1}{0.0447 + \frac{50.66}{1200}} = 1.12$$

$$\text{At 600 f.p.m., } K = \frac{1}{0.0447 + \frac{50.66}{2400}} = 1.52$$

Therefore, the rate of heat transmission by the coils at an air velocity of 600 f.p.m. will be:

$$\frac{1.52}{1.12} \times 67{,}000 = 91{,}000 \text{ B.t.u. per hr.}$$

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QUESTION 102. *We have a 150-kw. generator driven by a 200-hp. uniflow engine, operating non-condensing at 125-lb. gauge. The load on the generator is practically constant, and averages about 120 kw. for 8 hr. per day. How much heat is available in the exhaust steam for warming an adjoining office building?*

K. & M. Co.

ANSWER. The mechanical equivalent of 120 kw. is 161 hp., and the engine is therefore operating at roughly 80% of rated load. The steam consumption of a uniflow engine at this load is given as about 25 lb. per i. hp-hr. when operating non-condensing, and the mechanical efficiency is in the neighborhood of 88%. Assuming 80% as the combined mechanical efficiency of the prime mover and generator, the steam consumption of the engine will be

$$\frac{25 \times 161}{0.80} = 5030 \text{ lb. per hr.}$$

Heat content of the input steam is 1192.1 B.t.u. per lb., assuming 100% dry saturated conditions. Therefore, the total heat input to the engine is 6,000,000 B.t.u. per hr.

The heat extracted from the steam by the engine is

$$\frac{161 \times 2545}{0.80} = 512{,}000 \text{ B.t.u. per hr.}$$

and the heat remaining in the steam, figured above the datum of water at 32°, is 6,000,000 — 512,000 = 5,488,000 B.t.u. per hr.

If the steam is used in the radiators at approximately atmospheric pressure, the temperature of the condensation will be about 200°. Therefore, the total heat available for heating purposes will be the difference between the heat left in the steam after passing through the engine, and the heat remaining in the condensation from the radiators. The heat remaining in the condensation from the radiators is 5030 × (200 — 32) = 845,000 B.t.u. per hr. Subtracting 845,000 B.t.u. from 5,488,000 B.t.u., we have 4,643,000 B.t.u. per hr. available to heat the office. This is nominally sufficient to take care of 19,000 sq. ft. of direct radiating surface.

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QUESTION 103. *If it is true that any electrical heating device is 100% efficient, and converts all the input energy into sensible heat, why is any one such heater more effective than another? It would seem that, were the above statement true, the simplest resistance coil would deliver as much heat to a given space as a more elaborate and expensive electric radiator, if both consumed the same amount of power.* *R. W. B.*

ANSWER. It is quite true that any electric heating device does convert electrical energy into sensible heat at an efficiency of 100%, but this does not necessarily mean that every such device is efficient as a space heater. The effectiveness of any heating device is more dependent upon its means of distributing the heat through the space to be heated and to the occupants thereof, than upon its ability to generate heat.

The heat evolved by the simple resistance coil would be transmitted away from it chiefly by radiation, to be absorbed by the walls of the room and by objects in the room. Only a very small portion of the heat would warm the air surrounding the coil, and be conducted by convection to the occupants of the room. The radiant heat reaching the occupants would be local in its effect, warming only those portions of the body exposed to the radiation from the coil.

On the other hand, if the heat evolved in the coil can be conveyed directly to an extended surface by some confined heating element, as is usual in electric radiators, the majority of the heat thus produced will be distributed through the space by convected warm air. The portion of the heat that is dispersed by radiation in this case will also be more effective in warming the occupants, since the extended surface will distribute it more uniformly.

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QUESTION 104. *Will you kindly differentiate between the terms "static head" and "velocity head" as used with reference to the flow of gas in a pipe?*

E. L. M.

ANSWER: Static head is the pressure which causes the gas to flow in the pipe, and velocity head is the pressure in the gas caused by its inertia, or tendency to continue in motion. Static head would be that pressure recorded by a pitot tube with its opening at right angles to the axis of the pipe, and would be exerted whether this gas were flowing or stationary. If a second pitot tube with a right-angle bend near its end be inserted in the pipe so that the opening is at the axis of the pipe, and headed in the direction from which the gas is flowing, the recorded pressure will be that resulting from the static head plus the velocity head. The velocity head will be the difference between the two pitot tube readings.

News of the Month

Building Construction Continues Upward Trend

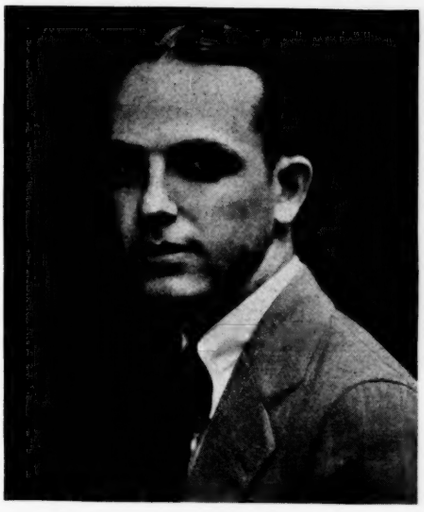
A continuance of the upward trend in building activity is noted in reports from F. W. Dodge Corporation and the U. S. Department of Labor. Dodge reports contracts awarded as totaling $122,615,700, as compared to $106,131,000 for August, a gain of almost 16%. While still slightly below the contracts awarded in September, 1932, in dollar volume, this is the first month in which the 1933 total closely approached the total for the corresponding month of 1932. The cumulative total for the first nine months of 1933 amounted to $743,553,300 as compared with $1,057,363,200 for the corresponding months of 1932.

Department of Labor figures, compiled from building permits filed in 764 cities having populations of 10,000 or more, indicate an increase in expenditure for total building construction during September of 9.7%, as compared with August. The total number of building operations decreased 3.7%. New residential buildings decreased 24.7% in number, but indicated expenditures for such buildings increased 20.8%. The number of new nonresidential buildings increased less than 1% over the preceding month, but indicated expenditures increased 23.2%. There was a decrease of 2.6% in the number and a decrease of 13.3% in indicated expenditures for additions, alterations, and repairs in these cities, comparing September with August.

Three Groups to Join Heat Transfer Discussion

Subjects of interest to heating engineers will be discussed in papers prepared for the three-session symposium on heat transfer to be presented at the annual meeting of the A.S.M.E., December 4-8, at the Engineering Societies Building, New York. The A.S.H.V.E. and the A.S.R.E. are cooperating with the mechanical engineers in the conducting of these discussions.

Following are papers scheduled for the afternoon session, Wednesday, December 6: "Heat Transfer Rates in Refrigerating and Air Cooling Apparatus," by W. J. King, heat transfer engineer, General Electric Company and "Heat



W. J. King, who will present a paper on Heat Transfer Rates before the A.S.M.E.

Transfer Rates in Heating and Ventilating or Air Conditioning Practice," by F. C. Houghten, director, A.S.H.V.E. Research Laboratory. An air conditioning session is scheduled for Thursday afternoon, December 7, at which time the following topics will be presented: "Psychrometric Investigations and Data," by Dr. F. G. Keyes, professor of Physical Chemistry, Massachusetts Institute of Technology; "Physiological Side of Air Conditioning," by R. R. Sayres, U. S. Bureau of Public Health, and "Noise Elimination and Air Motion," by C. B. Graves, manager, air conditioning department, Campbell Metal Window Corp., New York.

A.S.A. Committee Agrees on Noise Measurement Standards

Recognizing the economic value of quiet in commercial buildings as manifested in improved efficiency of office workers, the American Standards Association's sectional committee on acoustical measurements and terminology, established January, 1932, under the sponsorship of the Acoustical Society of America, has adopted tentative standards for reference levels, scales, and terminology of sound measurement. This agreement on noise measurement standards is urgently needed.

Vern O. Knudsen, president of the Acoustical Society and chairman of the committee, points out that present noise meters, manufactured and sold by several electrical concerns, have proven valuable in making relative comparisons of noises, but since no standard units or scales for the measurement of noise have been available, observations made with one type of meter could not be compared with those made with another. It has also been found that in many instances the same meter would register one noise as greater than another, in spite of the fact that in the judgment of observers, comparing the sounds by ear alone, the lesser noise seemed the louder.

Automatic Control Manufacturers Organize

Manufacturers of equipment for automatic control of temperature, pressure, air conditioning, and allied devices, have organized the Automatic Controls Institute in order to draw up a code of fair practice under the NRA.

Harrington Describes Conditioned Home of Future

In an address, "The Home of the Future," delivered at the National Electrical Exposition, Madison Square Garden, New York, September 20-30, Elliott Harrington, air conditioning engineer, General Electric Co., Schenectady, N. Y., described research activities in the G-E Air Conditioning Institute's proving home at Schenectady. Engineers of the company, in permanent residence in this house, are putting to test all manner of conditioning systems, and collecting data on costs and physiological effects.

Mr. Harrington looks upon air conditioning as a necessity in modern homes of the near future, and

called attention to the wide variety of proven equipment, suitable for large and small jobs of air conditioning, already available.

A considerable portion of the exhibition space at the show was devoted to air conditioning and oil heating equipment. Friday, September 29, was designated Air Conditioning Day, and the attention of the spectators was especially directed to this subject at that time.

Somers Forms Subsidiary

H. J. Somers, Inc., 1984 West Lafayette Blvd., Detroit, has organized the Somers Air Filter Sales Company. J. E. Randall, formerly sales manager of Young Bros. Company, has been placed in charge.

Illinois Chapter Studies Code at Annual Meeting

S. R. Lewis, consulting engineer, Chicago, addressed the Illinois Chapter, A.S.H.V.E., at its annual meeting held at the Sherman Hotel, October 9, on "The Code of Fair Competition for the Professional Engineer." Mr. Lewis was introduced by John Howatt who spoke briefly on the functions of the NRA and its effect on the industry.

New officers installed at that time are as follows: president, Charles W. DeLand; vice-president, Robert E. Hattis; treasurer, J. H. Milliken, and secretary, J. J. Hayes. George H. Blanding, J. J. Haines, and S. I. Rottmayer have been appointed directors for the coming year.

Eadie and Winslow Address New York Group

Dr. C.-E. A. Winslow, director, School of Public Health, Yale University, delivered an address, "What Is Fresh Air?" before the New York Chapter, A.S.H.V.E., at its opening meeting, October 16. Approximately 50 members and guests were present for dinner and the meeting.

Doctor Winslow described how former theories of ventilation laid emphasis on the removal of bad air, rather than upon the introduction of good air, and explained the manner in which present concepts of what constitutes good and bad air differ from the obsolete ideas. The present concepts are simpler, according to the speaker, being based fundamentally upon the matter of heat transfer, rather than upon such factors as carbon dioxide and supposed poisonous matter in vitiated air.

Radiant heating, as practiced in England, and the artificial ionization of air, into which extensive studies have been conducted in Europe, were discussed by Doctor Winslow, who believes that these subjects should be carefully investigated by American engineers. He stated, however, that sound basic information with respect to psychological and physiological reactions of the human system to these new principles of air conditioning is wanting, and that much research must be done before they can be applied. He does not foresee widespread installation of air conditioning in homes in the near future.

Following Doctor Winslow's address, John G. Eadie, of Eadie, Freund & Campbell, consulting engineers, spoke on "Highlights of the Engineers' Code." Mr. Eadie spoke with special reference to manufacturers who provide engineering services, and pointed out the difficulties this practice presents to the profession. He expressed the belief that the code as proposed is a step in the right direction toward emancipating the engineer from what he termed "sweat-shop conditions."

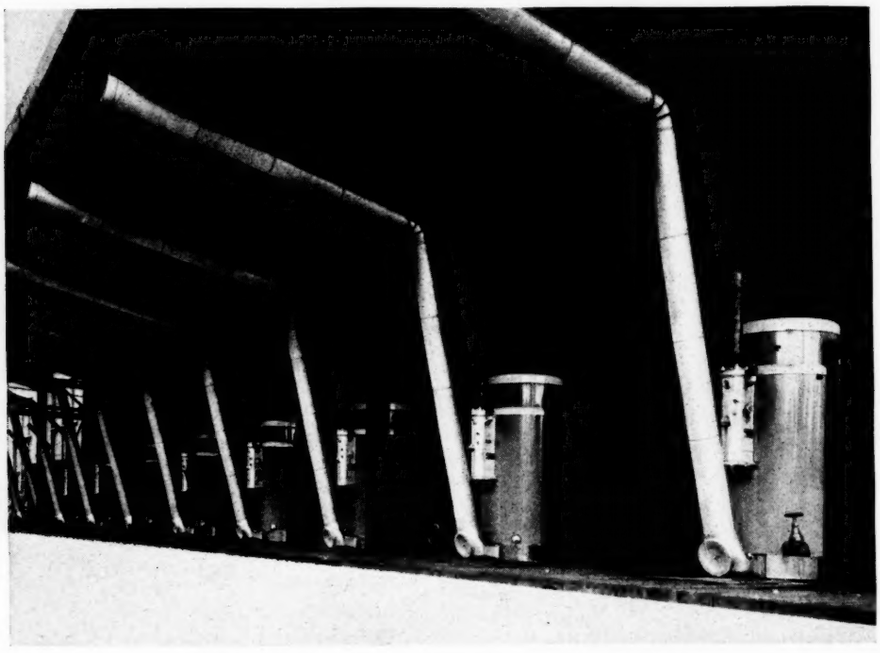
Hamilton Appointed Industrial Adviser

R. J. Hamilton, president of American Radiator Co., 40 West 40th St., New York, and vice-president of the John B. Pierce Foundation, was recently appointed industrial adviser for the cast-iron boiler and cast-iron radiator industry to act in connection with that industry's hearing before the NRA.

8% of Public Works Money Scheduled for Building

Allocations of the available $3,300,000,000 for public works totaled $2,049,767,088 up to October 17, according to Secretary Ickes, Federal public works administrator. Of this two billion, about $158 million, or 7.7%, has been allotted to building projects.

The bulk of the moneys so far allocated will go for naval construction, highway building, forestry work, dams, and similar heavy



G-E oil burners being tested out of doors to insure satisfactory operation and installation before shipment

engineering construction. The principal building projects provided for include $39 million for public buildings (under the supervising architect's office), $58 million for housing (under the army quartermasters' corps), $24 million for naval shore stations, and $37 million for low-cost housing projects in various cities.

Among the allotments made the week of October 7-13 were $9 million for buildings for the Bureau of Yards and Docks, Navy Department, including $2 million for Mare Island, Calif., and $4 million for Pearl Harbor, Hawaii.

An allotment of $14,500 was made to the Public Health Service Treasury for improving the steam heating system at the Rocky Mountain Spotted Fever Laboratory at Hamilton, Mont. The Treasury also received nearly half a million for Post Office buildings, and $315,000 for aid in building the New York City Post Office Annex.

The Department of Agriculture received $1.1 million for new buildings and laboratories for the Experiment Station at Beltsville, Md., and the Bureau of Agricultural Engineering $111,000 for building a laboratory at Auburn, Ala.

Other building appropriations were made as loans or grants for non-Federal projects, principal among these being El Paso County, Colo., high school, $939,000; Nashville, Tenn., dormitory, $400,000; Wilmington, Del., school $435,000; San Francisco, exposition buildings, $354,000; San Francisco Hall of Justice, $666,000, and Pawtucket, R. I., city hall, $425,000.

Atlanta, Ga., has been loaned $3.8 million for slum clearance and low-cost housing projects.

Sellman Heads A. G. A. Commercial Section

With total attendance in excess of 3000, the International Gas Conference and 15th annual convention of the American Gas Association was held in Chicago, September 25-28, at the Stevens and Blackstone Hotels. With emphasis on sales and the necessity for immediate action on current problems confronting the industry providing keynotes for the discussions, the four days were devoted to sessions of the Accounting, Commercial, Home Service, Industrial, Manufacturers' and Technical Sections.

One of the subjects of direct interest to the heating industry was a paper, "Capturing Today's Home-Heating Market," by C. A. Nash, United Light & Power Engineering and Construction Co., Davenport, Ia., presented at the second Commercial Section session. A report on the first 10 weeks of the Chicago area campaign for house-heating was rendered by Paul A. Jenkins, assistant manager of the campaign.

N. T. Sellman, Director of Sales and Utilization and Assistant Secretary, Consolidated Gas Co., New York, elected chairman of the Commercial Section, American Gas Association.

New officers of the A.G.A. elected for the 1933-1934 term are as follows: president, H. O. Caster, New York; vice-president, P. S. Young, Newark, N. J.; treasurer, William J. Welsh, Staten Island, N. Y. N. T. Sellman, New York, was appointed chairman of the Commercial Section, with F. M. Rosenkrans, Kansas City, Mo., vice-chairman. The Manufacturers' Section will be headed by John A. Fry, Detroit, with J. Scott Fowler, Philadelphia, vice-chairman of the Appliance Division, and Merrill N. Davis, Bradford, Pa., vice-chairman of the Apparatus Division.

Williams Holds Sales Meeting

Williams Oil-O-Matic Heating Corp., Bloomington, Ill., held a series of dealer sales meetings in Boston, Philadelphia, New York, and Washington, October 23, 25, 27, and 30, respectively, to discuss advertising and sales promotion measures in conjunction with the NRA campaign, "Now Is the Time To Buy." Oil-O-Matic dealers' unit sales in August showed a 127% increase over July, and a 48% increase over August, 1932.

Evening Air Conditioning Course Given in Cleveland

An evening course in Air Conditioning was instituted at Fenn College, 2200 Prospect Ave., Cleveland, September 21. The class meets at 7 p.m. for a two-hour period each Thursday evening, and the course is to extend through two semesters of five months each. The first semester will be devoted to fundamental characteristics, physiological relationships, definitions, and modern developments, while the work of the second semester will be concerned chiefly with engineering problems.

Walter J. Ottinger, consulting engineer, Cleveland, is in charge of the course. Tuition is $21 per semester.

Warren Webster Appoints Branch Manager

Warren Webster & Co., Camden, N. J., has appointed L. A. Bernert manager of its Birmingham, Ala., branch office, with offices in the Watts Building.

Oil Burner Show Scheduled for Philadelphia

At its regular quarterly meeting, held in Washington, October 10, the directorate of the American Oil Burner Association designated March 5-9 as the date for the 11th annual oil burner convention and show. The exhibition and convention hall of the Commercial Museum, Philadelphia, has been selected for these events, and the Benjamin Franklin Hotel has been chosen official hotel headquarters.

News of the Month

Exhibitors will be permitted to set up live exhibits, and it is expected that a display of burners in actual operation will increase public interest and attendance.

A constitutional amendment adopted at this meeting increases the number of directorships from 18 to 21, and E. A. Halblieb, Delco Appliance Corporation; A. J. Fleischmann, May Oil Burner Corporation; and J. H. Hirsch, Automatic Burner Corporation, were appointed to fill the new places.

Urges Government Construction

In a recent telegram addressed to President Roosevelt, Frederick W. Herendeen, secretary of The Institute of Boiler and Radiator Manufacturers, urges wise and generous spending on public and semi-public buildings by the Government to stimulate building construction throughout the nation. The telegram points out that residential building construction is at a low ebb, and states that Government building will be of immediate benefit to all kinds of labor.

N. Y. Housing to be Studied

An intensive and comprehensive study into slums and blighted areas, as to their causes, prevention, and rectification, has been undertaken by the Phelps-Stokes Fund, under the direction of Prof. James Ford, Department of Sociology, Harvard University, and editor of the 12 volumes on housing published by the President's Conference on Home Building and Ownership. George N. Thompson, until recently Assistant Chief of the Division of Building and Housing, United States Bureau of Standards, is associate director.

The investigation, which is expected to occupy 18 months, will be undertaken with particular reference to the problems and requirements of New York, and it is planned to draw upon the experiences of other cities here and abroad for purposes of comparative analysis. A historical division of the problem in New York will be included, and the topics to be studied include: relative responsibilities of Municipal, State, and Federal governments, various methods of land acquisition, condemnation proceedings, functions of limited dividend housing companies, and commercial housing developments.

25 Years Ago in

The Heating & Ventilating Magazine

NOVEMBER, 1908

NIAGARA RADIATOR AND BOILER CO., North Tonawanda, N. Y., has been organized with the following officers: president, E. C. Andrews; vice-president, J. T. Andrews; secretary, H. C. Ballard; sales manager, W. S. Newkirk, and plant manager, A. M. Everhart.

INCORPORATED, in Cleveland, The Smokeless Heat & Power Company, for $500,000. The process to be used has been tried out in a plant at Lima, and consists of a special device for converting crude or fuel oil into heat and power without smoke. Among the owners of the invention are J. W. Keenan and F. R. Hall, both of Cleveland.

LITTLE ROCK, ARK. In bankruptcy proceedings against the half-million dollar Central Heating Company here, the attorney for the company plead that the court had no jurisdiction, since the company did not manufacture anything, did not deal in merchandise and was not engaged in publishing. The judge agreed, leaving the case undisturbed in the Chancery Court.

PEERLESS HEATER CO., Pittsburgh, Pa., has been organized to manufacture Peerless boilers and radiators. President, C. Howard Hook, recently president of the Reliance Heater & Supply Company.

NEW YORK'S Public Service Commission has notified the street-car companies that they must provide better heating and ventilation for the street cars of the city.

PRESIDENT-ELECT William Howard Taft, in an address delivered at the laying of the corner stone of the New Woodward School in Cincinnati, the day

Wm. Howard Taft

following his election said, "It seems to me that the smell that used to pervade Old Woodward was necessary for the make-up of a thorough-going man." Mr. Taft was speaking with reference to the striking improvements in mechanical equipment in the new institution.

THE EDITOR OBSERVES that during the business troubles of the past year the dullness in the heating trade has not been without its compensating features, the most noteworthy being the opportunity offered business men to catch up with the technical side of their profession. It is not so easy today to find a progressive engineer who is not well informed as to the new developments described from month to month in the technical journals.

Western Pennsylvania Utilities Cooperate on Gas Heat Campaign

A joint advertising campaign inaugurated several months ago by the four major gas companies serving western Pennsylvania is emphasizing the convenience and economy of gas for house-heating. The participating companies are: Equitable Gas Company, Peoples Natural Gas Company, and Manufacturers Light & Heat Company, all of Pittsburgh, and T. W. Phillips Gas & Oil Co., Butler, Pa.

Air-Control Systems Acquired by New York Firm

Air-Control Systems, Inc., Chicago, has been acquired by Air Conditioning Industries, Inc., 101 Park Ave., New York. The latter company has taken over all manufacturing and distribution activities, and Air-Control Systems will function in the future only as a patent holding and licensing company, granting licenses to a limited number of other corporations to manufacture under its patents.

The manufacturing plant of Air-Control will remain temporarily in Chicago, executive and sales activities having been removed to New York.

Johnson Cites Anthracite Advantages

Allen J. Johnson, director, Anthracite Institute Laboratory, Primos, Pa., presented a paper, "The Advantages of Anthracite as a Domestic Fuel," before the fall meeting of the Coal Division of the American Institute of Mining and Metallurgical Engineers, October 27-28, at Columbus, Ohio. The discussion,

illustrated with lantern slides, described the various classifications of anthracite coal and the applications to which each is adapted, and reported the results of tests in which anthracite was compared with competitive fuels as to cleanliness, economy, convenience, and heating efficiency.

New Gas Heating Rate Approved for Brooklyn Utilities

A revised rate for gas used for space heating by customers of the Brooklyn Union Gas Co., Brooklyn, N. Y., has been approved by the Public Service Commission and went into effect on October 1. The new rate will be $1 for the first 600 cu. ft., or less, per month, and 7½ cents per 100 cu. ft. for all over 600 cu. ft. used per month. The customer must guarantee the company a revenue of $80 during the heating season of October 1 to May 31.

Similar rate revision was approved for the Kings County Lighting Company, which will bill house-heating customers $1 for the first 500 cu. ft., 9½ cents per 100 cu. ft. for the next 2600 cu. ft., and 6½ cents per 100 cu. ft. for all over 3100 cu. ft. per month. A minimum charge of $80 for the heating season will be made.

Noyes Reports Gain in Leasing

Charles F. Noyes Co., Inc., New York, large real estate operator, reports that its business for five months, May 1 to September 30, shows a marked increase in earnings over 1932. According to William B. Falconer, executive vice-president, the organization's net operating income for this period, normally the poorest months in its business year, was 147% greater than for the same period in 1932, and 1066 separate leasing transactions were negotiated during these months as against 474 transactions completed in the same months last year.

Mr. Falconer expressed an opinion that leasing was greater in volume this year than in any previous five months' period of the company's business activity.

New Distributors for McIlvaine

McIlvaine Burner Corp., 663 West Washington Blvd., Chicago, has appointed George H. Blood, 68 River St., Marlboro, Mass., and Buerkel and Co., Inc., 18 Union Park St., Boston, as distributors. The Utilities Distributing Corp., 79 Sabin St., Providence, R. I., McIlvaine distributor for Rhode Island, has appointed John W. Meiklejohn and Sons, Broad and Weybosset Sts., Providence, as dealers.

Fred W. Gatter, McIlvaine sales manager, has established temporary headquarters in New York for the balance of the year.

Detroit Contractors Organize

Organization of the Detroit Association of Warm Air Heating and Air Conditioning Contractors, with Albert S. Beck, 166 East Jefferson Ave., as secretary, has been announced. The association is the outgrowth of a meeting of representative contractors held last summer to consider the advisability of forming such a group to function under a code of fair competition.

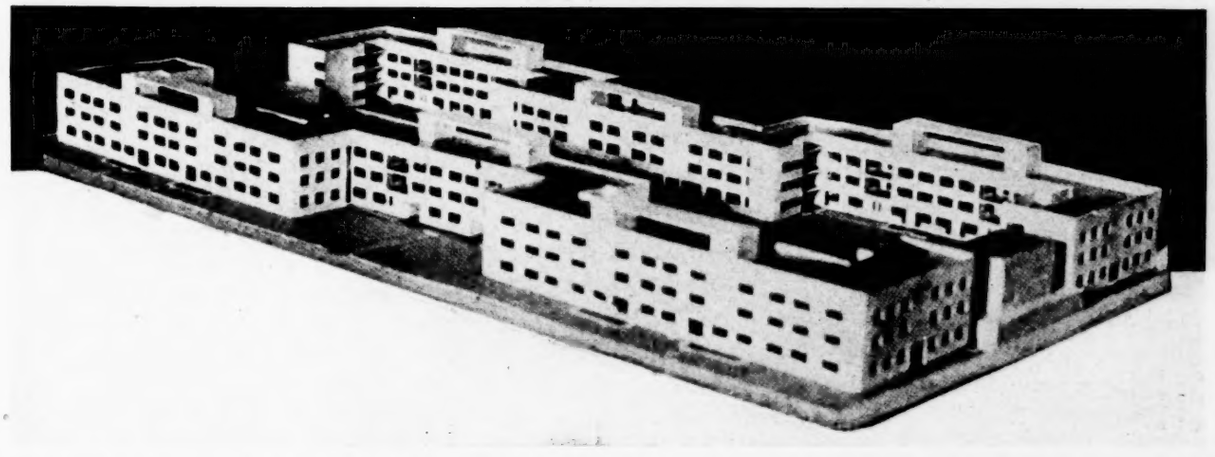
Present activities of the Association include preparation of a cost analysis of cleaning, repairing, and refitting of furnaces, and of gravity and forced-air and air conditioning installations. Arthur G. Marx is president.

Sarco Appoints Representatives

Sarco Co., Inc., New York, has appointed the following new representatives: H. C. Freese, 811 East Armour Blvd., Kansas City, Mo., and Colby Equipment Co., 136 North Delaware Ave., Indianapolis.

Kagey Describes Metropolitan Life Conditioning Plant

At the first meeting of the season, held at the Building Trades Club, September 28, the New York section, A.S.R.E., heard a paper, "The Air Conditioning System in the Metropolitan Life Building," presented by I. B. Kagey, formerly of Carrier Engineering Co., Newark. Mr. Kagey illustrated his paper with lantern slides. An inspection of



Proposed housing project in Kensington (Philadelphia) backed by the American Federation of Full-Fashioned Hosiery Workers. Three buildings, each accommodating 300 families, will comprise the project. Kastner & Stonorov, Philadelphia architects, designed the development and are largely responsible for the promotion of the idea.

News of the Month

the installation followed the presentation of the paper.

Mr. Kagey is in charge of the Metropolitan Life Building's air conditioning plant, and was also connected with its design.

L. L. Smith Heads Permutit Sales on West Coast

The Permutit Co., 330 West 42nd St., New York, announces that Lawrence L. Smith has been placed in charge of Permutit domestic sales in the Southwest and West Coast, with offices in Los Angeles.

C. O. Kimball has been appointed to represent Permutit in Maine and New Hampshire; Hansing & Hanks in Bergen County, N. J., and Eugene A. Carttar in Wichita, Kansas.

Coppus Appoints Wisconsin Representative

Coppus Engineering Corp., Worcester, Mass., has appointed the Blower Application Co., 918 North Fourth St., Milwaukee, to handle its line of filters in the state of Wisconsin, excluding Florence and Marinette Counties.

Electric Utilities Urged to Foster Air Conditioning

A recently issued report of the Edison Electric Institute, New York, presents suggestions for the promotion of residential air conditioning sales by electric utility companies.

In this connection, each utility is advised to create a promotional department consisting of one or more sales engineers to direct the company's activities in the field. This division should establish and maintain a cooperative policy with local air conditioning distributors to whom it should bear the relationship of consulting engineer and sales promoter. The report further recommends that the utility go as far with demonstrating and advertising as its budget will permit, availing itself of every opportunity to explain and demonstrate conditioning equipment before clubs, domestic science classes, etc. Special recommendation is given to a demonstration made in cooperation with one or more of the leading hotels and manufacturers of conditioning equipment whereby a prospective purchaser is invited to occupy a properly air conditioned room or suite of rooms for a night or two as guest of the utility company.

We take this opportunity of thanking the many readers who have expressed an interest in H.&V.'s Reference Data sheets, and especially those who have suggested ideas for future sheets. Many of these ideas have been acceptable. Preparation of the sheets takes some time, but we hope that readers will continue to offer suggestions, even though their proposed data do not appear at once.

THE EDITOR

Gas Heat Rates Cut by Long Island Utilities

Revised gas rate schedules designed to meet the competition of fuel oil for building heating were put into effect September 1 by the Long Island Lighting Company, the Nassau and Suffolk Lighting Company, and the Queens Borough Gas and Electric Company, utilities serving Long Island, N. Y.

Crew-Taylor Moves

Crew-Taylor Engineering Corporation has removed its offices and factory to 305 East 45th St., New York.

Foreclosures Averted by Home Loan Corporation

An announcement of the Home Owner's Loan Corporation, Federal agency for relief of distressed homeowners, reveals that up to October 6 a total of 17,957 foreclosures on urban residential properties, valued at $49 million, have been avoided by the corporation's activities since its institution. In addition, the corporation through local offices has averted a total of 1080 foreclosures, by assisting homeowners to negotiate extensions of existing mortgages or in refinancing these mortgages outside of the corporation.

N. W. A. H. & A. C. A. Plans Convention

Preparations are nearing completion for the winter convention of the National Warm Air Heating and Air Conditioning Association, to be held at the Netherland Plaza Hotel, Cincinnati, December 5-6. Timely subjects to come up for discussion include a report to date of research activities in cooperation with the University of Illinois, the effects of the NRA on the industry, and some technical and commercial considerations of air conditioning.

A meeting of the Association's board of directors and various standing committees will take place on December 4.

Boker New Armco Distributor

American Rolling Mill Co., Middletown, Ohio, has appointed H. Boker & Co., Inc., 101 Duane St., New York, as distributor of its stainless steel sheets.

Westinghouse Names 50 Dealers

Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., has announced the appointment of more than 50 dealers for the company's air conditioning equipment in the seven geographical sales districts of the country.

District Steam for New Post Office

A contract has been awarded the Detroit Edison Company for the heating of the new U. S. Post Office Building in Detroit for the present heating season. The building is nearing completion and will be ready for occupancy some time during the coming winter. A gross volume of approximately 10 million cu. ft. will be heated.

Steam will be supplied through a 12-in. service main at a pressure of 10 lb. to 12 lb. per sq. in. The Treasury Department estimates the annual steam consumption to be 45 million lb. and the maximum demand 22,500 lb. of steam per hour.

Electrical Ass'n Distributes Air Conditioning Booklet

"Custom Weather" is the title of an attractive booklet recently published by The Electrical Association of Philadelphia, Architects Building, Philadelphia. Interspersed with an elementary account of the development of air conditioning are installation photographs of commercial, residential, and industrial applications and recent advertising copy sponsored by the air conditioning group of the association.

Watson Joins Staff of Tom Brown

W. W. Watson, formerly engineer of the Comfort Cooling Bureau conducted by the Detroit Ice Publicity Association, has become associated with Tom Brown, 487 West Alexandrine Ave., Detroit, manufacturers' agent for air conditioning equipment.

Burner Code Amended

Following President Roosevelt's approval of the NRA code for the oil burner industry, September 18, as announced on these pages last month, an amendment was made and approved by the President October 3. The amendment, which relates to specifications of distillate burners, is in the form of an addition and will constitute a new Section 12 of Article VI.

The provision became effective October 13, with the proviso that it would not prohibit the sale, within a period of 30 days, of existing stocks of distillate burners.

Contracting Up in N. Y. State

Heating and piping and heating and plumbing contractors in New York State reported improved business conditions in August, according to the State of New York Department of Labor.

Employment, payrolls, and manhours reported by general building contractors and subcontractors in that state in general showed a substantial gain in August as compared with July.

Manhattan Building Shows Gain over 1932

Plans for new buildings and alterations filed with the Manhattan Department of Buildings during September showed a decided increase over the totals for the same month last year, according to Samuel Fassler, Commissioner of Buildings. Plans were recorded during September for 16 new structures involving a total estimated expenditure of $5,480,000 as compared with plans for 11 new buildings costing $140,510 recorded during September, 1932.

News of the Month

New Representatives for Ames

Ames Pump Co., Inc., 30 Church St., New York, announces the following new representatives: Hoyt-Grant Co., 52 Whitney Ave., New Haven, Conn.; Sheffler-Gross Co., Drexel Building, Philadelphia, and Chase Pump & Equipment Co., 345 Montgomery Ave., Providence, R. I.

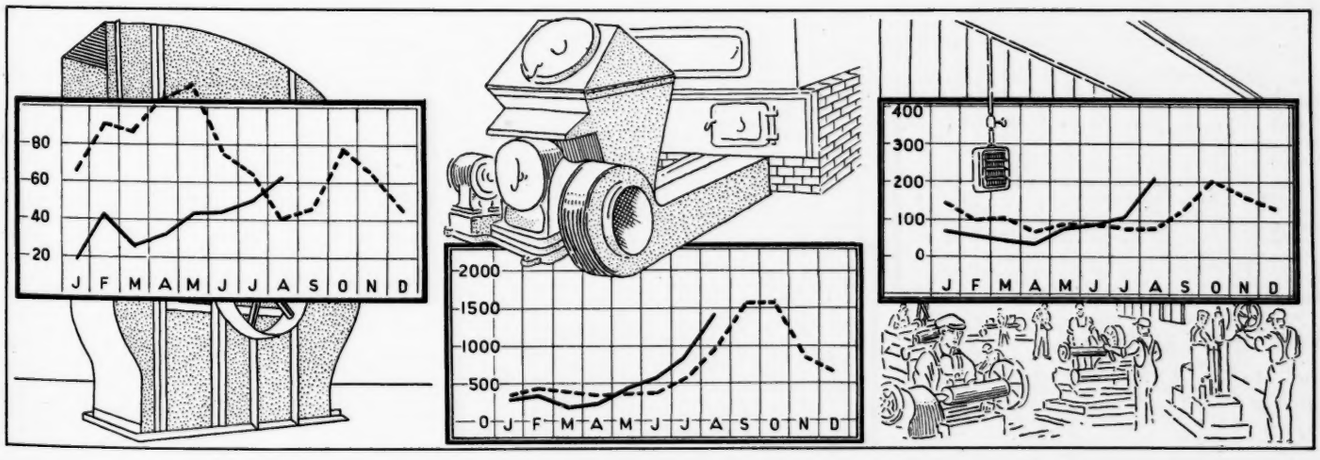
Planes Precooled with Dry Ice

Precooling commercial passenger airplanes with solid carbon dioxide was accomplished in tests made this past summer by the United Air Lines in Chicago.

The dry ice container was placed in the plane for a period of from 12 to 15 min., during which the temperature was reduced from 90° to 65°.

Natural Gas to be Distributed in Davenport, Ia.

A 25-year natural gas franchise has been awarded The Peoples



BUSINESS GOING UP!

August sales of blowers, stokers, and unit heaters pass those of last year, as shown in the above charts in which 1932 figures are represented by the dotted lines, 1933 by solid lines. Blowers for ventilating uses, plotted in thousands of dollars, are up 48.6% over August last year. Domestic and commercial stokers, plotted above in number of units, increased 46% over 1932, while unit heaters, plotted in thousands of dollars, had a 162.7% jump over August, 1932.

News of the Month

Light Co., Davenport, Ia., and operations will be undertaken immediately to connect the company's mains with a trunk pipe line which crosses the Mississippi about 10 miles down stream. New rates will effect savings of from 17.5% to 27.5% for consumers. Natural gas will be mixed with manufactured gas at a one-to-one ratio during the change-over period to enable consumers to adjust their equipment to the new fuel.

Burner Code Authority Organizes

A second meeting of the Oil Burner Code Authority was held in Washington, October 11, at the Wardman Park Hotel, to effect further organization of that group. It was announced at this time that Morgan J. Hammers, vice-president and general manager of Petroleum Heat & Power Co., Stamford, Conn., and chairman of the Code Authority, has been granted an indefinite leave of absence by his company in order that his full time may be devoted to the organization and activities of the Code Authority.

Appointments to serve on the finance committee were as follows: Morgan J. Hammers, chairman, R. M. Sherman, and R. S. Bohn. The committee on incorporation of the Code Authority will comprise Morgan J. Hammers, H. Finnie, W. S. Salway, L. E. Johnson, and R. S. Bohn. Mr. Finnie was appointed chairman of the standing committee on uniform cost accounting.

Plumbing and Heating Bureau to Relinquish Publicity Activities

Responsibility for the policies and financing of the publicity activities of the Plumbing and Heating Industries Bureau will be turned over on January 1, 1934, to the various associations of manufacturers, wholesalers, and contractors in the industries, according to an announcement of the Bureau. This action was taken at the quarterly meeting of the board of directors at the Stevens Hotel, September 23, in the belief that the publicity program is more properly a function of the associations. A second motion passed at the meeting provided for the drawing up of a new constitution and by-laws for the Bureau.

Edge Moor Announces Gas Boiler Division

Edge Moor Iron Co., Edge Moor, Del., has acquired exclusive right under the Irwin patents to manufacture and distribute Irwin automatic gas-fired boilers for all domestic, industrial, and commercial purposes. A Gas Boiler Division has been organized to handle these products. George H. Irwin has been appointed chief engineer of the division, with Frank S. Luney as his assistant.

Detroit Heating Men Open Season with Golf and Dinner

An outing and dinner held at the Detroit Golf Club, October 4, at which 80 members and guests were in attendance, initiated the season's activities of the Michigan Chapter, A.S.H.V.E. The gathering was addressed by C. V. Haynes, first vice-president of the society, who told of preparations under way for the annual meeting in New York during February. Toastmaster of the evening was Cecil Farrar, Buffalo, N. Y., former treasurer of the society, who called upon several present for remarks.

COMING EVENTS

DECEMBER 4-8, 1933. Fifty-Fourth Annual Meeting of the American Society of Mechanical Engineers, to be held in New York. Headquarters at 29 West 39th Street.

DECEMBER 5-6, 1933. Convention of the National Warm Air Heating & Air Conditioning Association, to be held in Cincinnati, Ohio. Headquarters at the Netherland Plaza Hotel.

DECEMBER 6-9, 1933. Twenty-Ninth Annual Meeting of the American Society of Refrigerating Engineers, to be held in New York. Headquarters at the Hotel New Yorker.

FEBRUARY 5-8, 1934. Fortieth Annual Meeting of the American Society of Heating and Ventilating Engineers, to be held in New York. Headquarters at the Hotel Biltmore.

FEBRUARY 5-9, 1934. Third International Heating and Ventilating Exposition, to be held in the Grand Central Palace, New York.

MARCH 5-9, 1934. Eleventh Annual Convention and Show of the American Oil Burner Association, to be held in Philadelphia. Exhibition and Convention Hall of the Commercial Museum to be the show site; Hotel Benjamin Franklin to be hotel head quarters.

NEW CATALOGS

The Brown Instrument Co., Philadelphia, has issued Catalog No. 6702, describing and illustrating its line of thermometers and pressure gauges. Construction details and engineering data are included; standard size, 80 pages.

A. M. Byers Co., Pittsburgh, Pa., has issued a booklet, "Welding of Genuine Wrought Iron," containing information of interest to the welder, fabricator, and designing engineer. Contains a complete table of sizes of welding fittings; five pages, standard size.

Commodore Heaters Corp., 11 West 42nd St., New York, has issued a price bulletin covering Convectofin built-in heaters. Included are drawings and data for seven different installation types, along with general terms and conditions; standard size, 4 pages.

Scott-Newcomb, Inc., 1934 Pine St., St. Louis, has issued a booklet, "Heating Economically with Oil," describing the S-N oil furnace. Descriptions and photographs of the mechanical details of this equipment are presented. Request Form No. 107.

Tube-Turns Incorporated, 1300 South Shelby St., Louisville, Ky., has issued Price List 404, containing descriptive information and dimensional and engineering data on Tube-Turns, welding flanges, tees, etc.; standard size, 23 pages.

Worthington Pump and Machinery Corp., Harrison, N. J., has issued Bulletin L-600-B2 describing Worthington feather valve-equipped compressors for refrigeration. Construction details are illustrated along with installation photographs; standard size, 15 pages.

New Equipment

Ray Announces Domestic Burners

Ray Burner Co., 401 Bernal Ave., San Francisco, Calif., manufacturer of commercial and industrial oil burners, has announced a line of burners of suitable size for residential use.

These burners are basically similar to the larger equipment, but have certain developments and refinements adapting them to residential use. The model with electric ignition utilizes a hot wire element, energized at low voltage, rather than the usual high-tension jump-spark. In this burner the air-to-fuel ratio is regulated by the motor speed, the air supply being cut down for ignition and increased for a leaner mixture during operation. The burner is also available with manual ignition or with electric-gas ignition for domestic use.

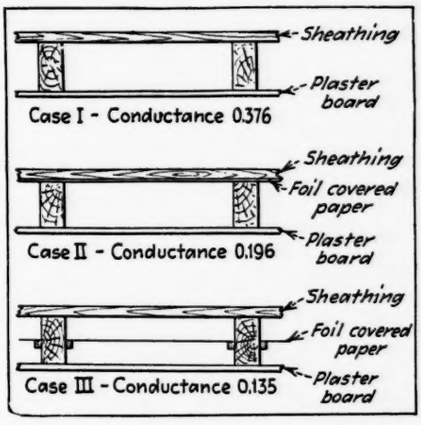
Control Prevents Stratification

Continuous reconditioning of air and avoidance of the condition known as "cold 70" is claimed for the multi-speed automatic control, applied to Hot-Kold forced-air conditioning systems by The Edwards Manufacturing Co., Cincinnati, O.

The control maintains constant operation of the fans at different speeds, depending upon the heating layout, and each fan has a corresponding gas rate automatically selected by a single room thermostat. When no heat is required, the fans are not idle, but continue to circulate the air for filtration, dehumidification, and the prevention of stratification.

Aluminum Foil for Building Insulation

A new building insulating material, Reynolds Metallation, is unique in that it reduces heat transfer in spite of having no claims of being a non-conductor. Made by the Reynolds Metals Co., Inc., 19 Rector St., New York, the insulation is made of highly-polished thin sheet aluminum cemented to a tough craft paper, and possesses the property of reflecting 95% of all radiated heat, thus preventing the flow of heat through the insulated wall. The material is available in two forms—craft paper with one surface covered with the sheet aluminum, another with both surfaces of aluminum.



Two methods of applying Metallation, compared with ordinary construction

When the metal surface faces the direction from which heat is flowing, 95% of this radiated heat is reflected back. Where the polished surface faces the opposite direction, the low emissivity factor of the aluminum surface retards passage of the heat. In either case it is claimed that only 5% of the heat passes through.

Reynolds Metallation comes in various forms and thicknesses, one being 0.0095 in. thick. The form advocated for most purposes consists of thin, highly-polished sheet aluminum cemented to either one or both sides of a tough craft paper. There is an additional form which combines the function of both the insulating material and lath, and to which the plaster can be directly applied.

The accompanying drawing shows a comparison of a typical type of uninsulated construction with alternate methods of using the Metallation, together with the heat transmission coefficients for the three constructions. The conductivity is said to be about that of 3½ in. of plaster board. Aging, with consequent oxidation, has practically no effect on the insulating properties.

Additional advantages claimed include low cost and light weight.

Petro-Arcola Combination Announced

Petroleum Heat and Power Co., Stamford, Conn., has announced the Petrola, combining a Petro oil burner, and an Arcola heater, product of American Radiator Co., 40 West 40th St., New York. Units are available in five sizes ranging in capacity from 200 sq. ft. to 400 sq. ft. of equivalent direct steam radiating surface.

The burner used in this combination has been developed expressly for use in the Arcola heating unit. It is of the horizontal rotary cup type, producing a short, bushy, low velocity, and highly luminous flame. With this method of combustion the fuel is introduced into a long conical, rotating cup which reduces even the heaviest oil into a thin film before it is thrown centrifugally from the edge of the cup. Air from the burner fan passes down through the nozzle of the burner and out over the edge of the cup where it is deflected by angular vanes in a reverse direction to the rotation of the cup. The volume of air for correct combustion is proportioned by an air adjustment built into the burner. Gas ignition is employed. The manufacturer states that installation requires a minimum of skill and labor, since the burner and boiler are an integral unit, shipped assembled.

Hays Markets Electric Contact Draft Gauge

A complete line of electric contact gauges for draft, pressure, and differential draft or pressure in ranges from 0.1 in. to 100 in. of water has been announced by The Hays Corp., Michigan City, Ind. This equipment employs the Hays dry-type actuating unit, and is available for either high or low voltage

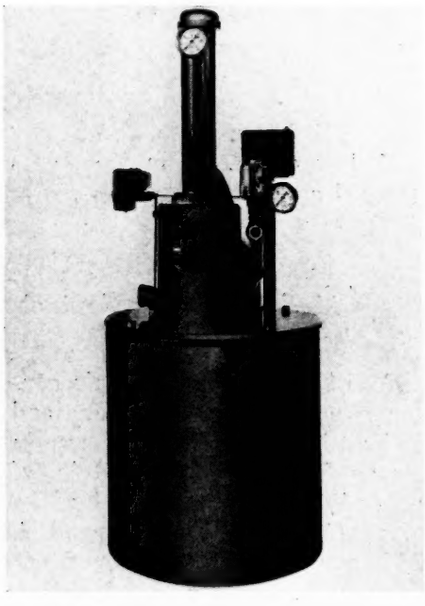
New Equipment

contact service or in combinations of both, equipped with closed mercury switches or open contacts to meet the requirements of the service. The manufacturer recommends it for use in applications where it is desired to sound an alarm or light a bull's-eye when pressures reach a pre-determined high or low point as in ventilating, drying, and dust collecting systems. It can also be used in conjunction with intermediate devices to open and close dampers, start and stop fan motors, and similar applications.

A small cast aluminum case mounted beneath the gauge accommodates either one or two single or double contact units or a single and double contact unit and a second unit which indicates the pressure or draft being measured.

Insley Makes Small Vacuum Pump

Insley Engineering Corp., Indianapolis, Ind., is marketing Whittington Lo-Line Junior vacuum heating pumps for small heating plants. These pumps are available in two sizes having capacities of 2500 sq. ft. and 5000 sq. ft. of equivalent direct steam radiator. The unit may be mounted on the basement floor when returns are high, or installed with cover of circulating tank flush with floor where return lines are low.



Lo-Line Junior vacuum heating pump

Pump is of the conventional centrifugal type with bronze impeller mounted on a large ground stainless steel shaft. The pump is rigidly mounted on the frame of the ball-bearing type motor, and is direct-driven. The motor is bolted to the cover of the circulating tank. The cover is provided with a heavy gas-tight gasket, and is hinged to the tank to give access to the pump and basin. The pump is vacuum-primed and vented, permitting the handling of high-temperature condensation.

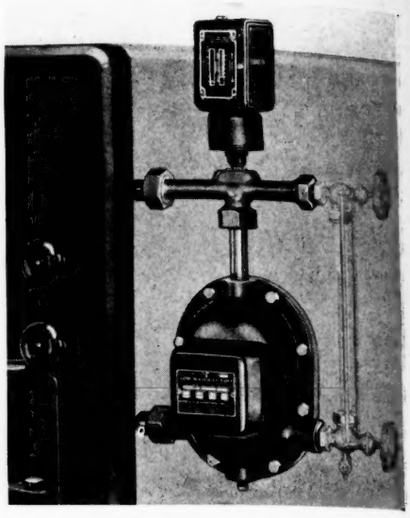
Experimental Kit for Photo-Electric Studies

For engineers and manufacturers desiring to experiment with photo-electrical smoke detection, and the various applications of photo-electrical control to industrial processes, the Weston Electrical Instrument Corp., 614 Frelinghuysen Ave., Newark, N. J., has announced the Photronic control kit. All equipment necessary for experimentation is included, together with diagrams of connections.

Minneapolis-Honeywell Offers Complete Boiler Protection

Inexpensive protection against damage to steam heating boilers from low water or dry operation is offered in the bellows-sealed, packless construction low water cut-off, duplex switch, and water feeder, recently announced by Minneapolis-Honeywell Regulator Co., Minneapolis, Minn. The control is designed for gauge glass mounting for simple and inexpensive installation.

If the low water cut-off is used alone, the fire will be shut down in the event of low water, and can not be started again until the boiler is manually refilled. When used with the silent solenoid valve attachment, the control will provide for automatic refilling of the boiler. If the water feeder valve is not used, the connections provided for it may be used to operate an alarm bell.



Minneapolis-Honeywell boiler control

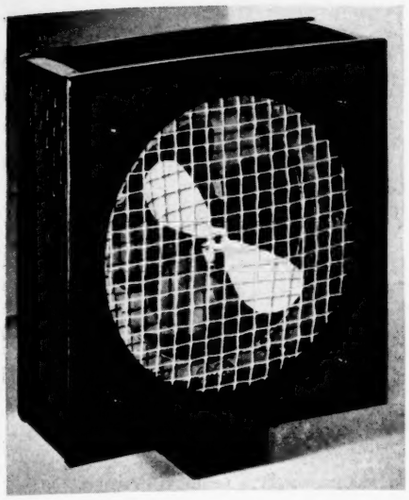
The water feeder valve is installed directly in the cold water inlet, and is therefore free from liming and sediment accumulation.

Further to simplify installation the steam or vapor pressure control may be screwed into the built-in syphon on top of the low water cut-off, providing the additional protection of high limit control. Automatic water feeding may also be included with this latter combination. This equipment is available for any pressure up to 25 lb.

Chromalox Electric Unit Heaters

Chromalox electric unit heaters are a recently announced product of Edwin L. Wiegand Co., 7500 Thomas Blvd., Pittsburgh, Pa. They are available in six models having power ratings ranging from 1.5 kw. to 4.5 kw., and air deliveries of 450 c.f.m. and 650 c.f.m. The manufacturer recommends their use for auxiliary, temporary, or permanent heating in offices, shops, and factories, to supplement or replace a central heating system.

Heaters utilize what the manufacturer terms the Heetflo principle, whereby the air is drawn in at low velocity from all four sides of the casing, and circulated over heating elements of large area. These heating elements are circular in form and are arranged about the periphery of the fan. The elements are embedded in a refractory material under hydraulic pressure and en-



Chromalox electric unit heater

tirely encased in a sheathing of chrome steel. Circulation is induced by a direct-driven propeller-type fan. These heaters may be had with automatic temperature control consisting of a room thermostat which switches the units on or off without the use of relays.

Chromalox heaters are also available in small portable models for home and office use. The company's complete line of blower-type and convection-type heaters are described in bulletins C-118 and CA-108.

Jackets for Spencer Boilers

A two-tone jacket as optional equipment for its line of magazine feed boilers has been announced by Spencer Heater Co., Williamsport, Pa. This jacketing serves the double purpose of guarding against dirt and dust, and of beautifying the boiler room.

G. E. Smoke Density Indicating and Recording Equipment

Photoelectric equipment for indicating and recording the density of smoke passing through stacks or breechings of heating and power plants has been announced by General Electric Co., Schenectady, N. Y. Changes in smoke density are indicated on a meter. A running record of the amount of smoke passed up the stack may be obtained by the addition of a recording instrument.

Essential elements of the apparatus are a light source and a photoelectric relay unit. Recording instrument is optional. The photoelectric unit and the light source are designed for mounting on opposite sides of the stack so that the light beam from the light source passes through the stack and falls on the phototube. When there is no smoke in the stack the full intensity of the light is directed on the phototube and the indicating or recording instrument will register zero smoke density. As the smoke density increases, the phototube receives less light from the source and the instrument indicates or records the increase of smoke.

Lenses are provided in front of the phototube and light source and clean air is drawn by the induced draft of the stack across the lenses, which assists in keeping them clean. The apparatus has been designed so that the lenses are easily accessible.

Light source and photoelectric relay unit are enclosed in cast-iron cases for durability and protection against dust and moisture.

Johnson Motor Company Enters Water Heater Field

Oilway kerosene-burning automatic storage water heaters, with capacities ranging from 22 gal. to 48 gal., have been announced by Johnson Motor Co., Waukegan, Ill., producer of outboard motors.

A simple temperature control regulates the flow of distillate to the burner, and two diminutive kerosene pilot lights burn constantly for ignition. Units are pleasingly modern in design, with galvanized sheet steel tank finished with two coats of lacquer in tones of tan and brown.

Power Factor Correction

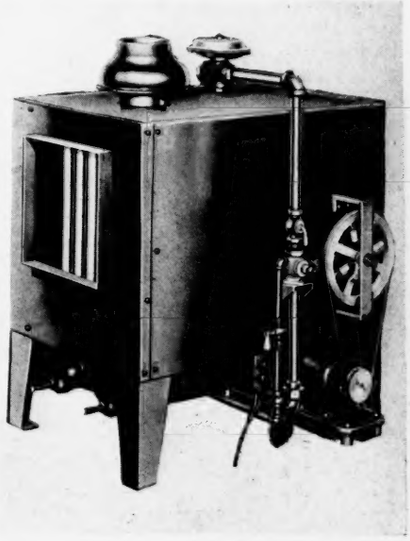
Power factor rectification for induction motors is provided by a complete line of static condensers developed by The Ideal Electric and Mfg. Co., Mansfield, Ohio.

These capacitors are of unit-type construction, comprising an assembly of small, independent, hermetically-sealed condenser units. Each unit has been heat-treated and oil-impregnated under a vacuum and is provided with fuses. Capacitors are available in either the box-type or the rack-type. Box-type capacitors are mounted in welded sheet steel cases supplied with weatherproof covers, suitable for either indoor or outdoor service. Rack-type capacitors are generally employed in sizes over 30 kva., and are supplied in weatherproof housings or with heavy steel screen enclosures for indoor use. This equipment is made for all voltages up to 4600 volts for any frequency and phase arrangement.

Humphrey Has Compact Forced Circulation Unit

General Gas Light Co., Kalamazoo, Mich., is marketing the Humphrey gas-fired warm-air unit for forced circulation heating of residences and small commercial buildings. The heater is remarkably compact and is quickly and easily installed, either for automatic or manual operation.

Circulation is induced by a self-contained multi-blade blower, V-belt driven by a 1/6-hp. motor. On starting the motor, a centrifugal governor on the drive wheel opens the main gas valve, allowing gas to



Humphrey warm-air unit

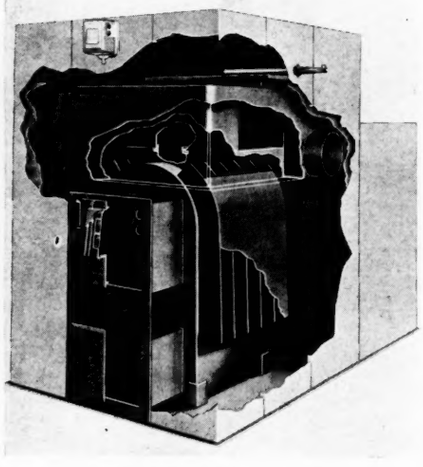
flow to the burner where it is ignited by the pilot. Upon stopping the motor, the governor automatically shuts off the fuel. The burner cannot operate unless the motor-driven fan is running. A bimetal coil and mercoid switch above the pilot controls the operation of the heater to prevent starting of the fan and opening of the gas valve in the event of pilot failure.

Hot products of combustion are conducted through brass radiating elements, and the heat is transmitted to the circulated air, passed over the elements by the fan. The unit is equivalent to 340 sq. ft. of direct steam radiating surface, and has an hourly input rating of 100,000 B.t.u. Delivery capacity is 850 c.f.m. at 0.10 in. water gauge pressure. Outlet temperature is 160° at a room temperature of 72°.

Premier Announces Furnace for Automatic Firing

Premier Warm Air Heater Co., Dowagiac, Mich., has announced the Premier Automatik warm-air furnace designed for oil, gas, or stoker-firing. The unit is of welded steel construction and is available in two sizes for residential heating.

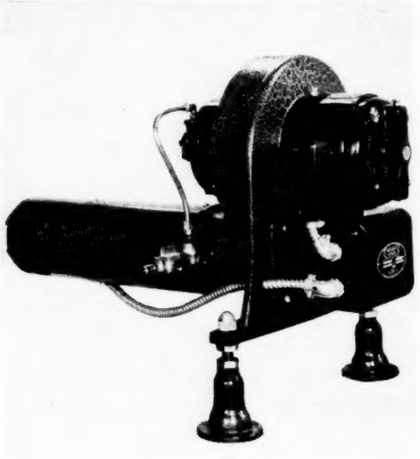
Combustion chamber is unusually spacious. Combustion gases pass through the heat exchanger in a horizontal spiral path, guided against finned heat exchanger surfaces by circular baffle plates. A thin film of casing air surrounds the heat exchanger surfaces providing quick temperature rise in the bonnet. Furnace front is easily detachable for convenience in installing and rendering the interior accessible for any type of refractory chamber required for the burner. Heaters are designed to pass through average width door openings.



Premier Automatik

Harvey-Whipple Has Oil Burner for Small Homes

Harvey-Whipple, Inc., 55 Emery St., Springfield, Mass., has announced the Master Kraft Junior oil burner, designed to heat homes of six to eight rooms.



Junior Master Kraft oil burner

This burner utilizes the same pressure-atomizing principle found in the company's larger burners. Oil is delivered to a stainless steel nozzle through a brass tube, and a multi-port air diffuser induces a multiple flame combustion adapted to any type of fire box. Low cost domestic fuel oils may be burned.

Units are completely equipped with automatic controls and safety devices, including a "magnetic eye" which is trained on the flame and prevents its operation should improper combustion take place.

Bryan Announces Refinements to Boilers

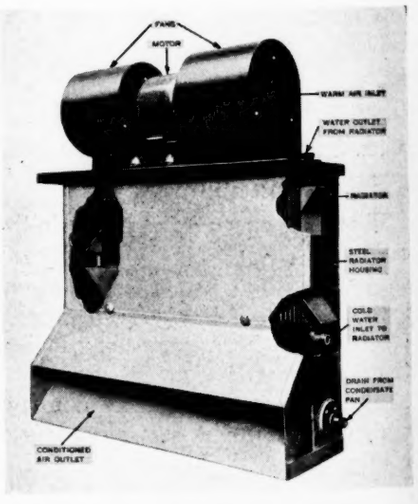
Bryan Steam Corp., Peru, Ind., has announced several improvements in the design and construction of its line of oil and gas-burning heating boilers. A new jacket of heavier gauge Toncan oven lining stock, of such design as to be absolutely air-tight, has been adopted. The manufacturer states that this jacket possesses increased rigidity, and can be more easily removed from the boiler for inspection and cleaning.

Other improvements include heavier gauge copper tubing of increased diameter, and the removal of the service door from the side of the boiler to the front of the boiler. The inspection window, formerly in the side of the jacket, has been transferred to the service door.

Fairbanks, Morse Introduces Year-'Round Conditioner

Fairbanks, Morse & Co., 900 South Wabash Ave., Chicago, offers all-year conditioning functions in Ortho-Clime units for residential, commercial, and institutional installation.

Tap water is circulated in a finned radiator for summer cooling and dehumidifying, and low-pressure steam or hot water heats the same surface for winter warming. Water condensed on the surface flows out through a drain connection, carrying with it dust and foreign matter collected on the finned surface. A small spray provides humidification for winter operation. Change-over from summer to winter operation is made by simply manipulating valves



Cutaway view of interior, cabinet-type Ortho-Clime

to cut off the flow of cold tap water and admit steam or hot water to the radiator. Air is circulated through the conditioner by four multi-blade blowers direct driven by a 1/20-hp. motor.

From ½ g.p.m. to 3 g.p.m. of tap water are sufficient to dehumidify and reduce the temperature by 10° in from 1500 cu. ft. to 3000 cu. ft. of space, depending upon the temperature of the cooling water, according to the manufacturer. Where a sufficient supply of tap water is not available, the unit may be used in conjunction with a refrigerating compressor, expansion of the refrigerant taking place directly in the finned coils. Ortho-Clime units are available in the cabinet type for floor mounting, and in the wall-mounting type.

Humidifier Attaches to Steam Pipe

Hitchings and Co., Elizabeth, N. J., has developed the Home Air-Moistener, an automatic humidifier utilizing heat from the steam main to evaporate water into the atmosphere. The manufacturer recommends it as of adequate capacity properly to humidify the air in the average residence of up to 12 rooms.

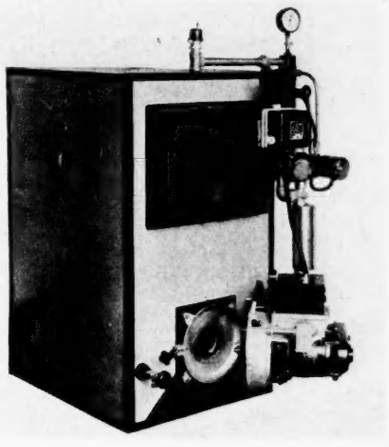
Installation is made by mounting the humidifier on the steam main in the basement, as shown in the illustration. The vaporizer is connected to the water supply, and an automatic electric valve maintains the water at the proper level. Vapor is conducted through a pipe to a copper dispenser, concealed behind the most used radiator on the first floor, and this moisture, introduced into the stream of warm, dry air rising from the radiator, is quickly dispersed in the air throughout the house.

The quantity of water vaporized is in proportion to the heat produced in the system, so that humidity is added to the air in the amount needed.

Home Air Moistener installation

Quick-Steaming Cast-Iron Boiler

Several design innovations, intended to secure the quick-steaming characteristics of the flash boiler while retaining the normal quantity of water, are incorporated in the Van Fleet burner-boiler assembly, recently announced by Sharp & Van Fleet Mfg. Co., Inc., Dover, N. J. These boilers are available in a range of sizes of suitable capacities to meet average residential requirements of from five to 25 rooms.



Rear of Van Fleet burner-boiler assembly

Boiler sections are of cast iron and are of unusual design, exposing 20% of the contained water to the radiant heat of the combustion chamber and the higher temperature combustion gases in the first and second passes. The remainder of the water in the boiler is preheated by the cooler combustion gases. Circulation is said to be extremely rapid in the steam generating portion of the boiler, with a positive and slower circulation in the preheating division.

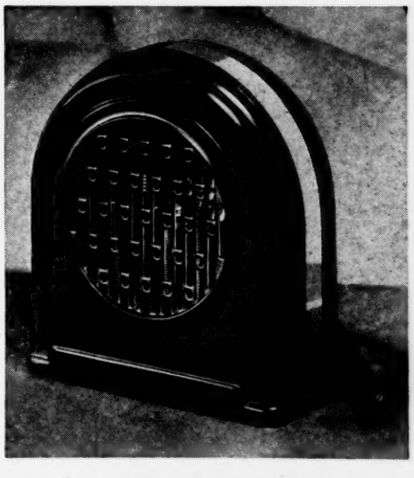
Burner is mounted directly on the rear of the boiler unit, and complete automatic control is included. The assembly is insulated, sides and top, with a wool blanket, 1-in. thick. Domestic hot water attachment is provided for year 'round supply. The boiler is also available for hand-firing or stoker-firing.

Pipe Tools Having Wooden Jaws

Wolverine Industries, Harbert, Mich., has placed on the market a line of Velvo-Grip wrenches and vises, said by the manufacturer to be capable of holding any material without scratching or crushing. Both tools use wooden jaws which grip the material over the full surface. They are said to be particularly adapted to the handling of all kinds of pipe and tubing.

Westinghouse Announces Small Circulating Room Heater

An air circulating heater designed for use in cold bedrooms, bathrooms, and other locations where heat is desired on chilly mornings and evenings, has been developed by Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. It is designated RM-16.



Air circulating heater

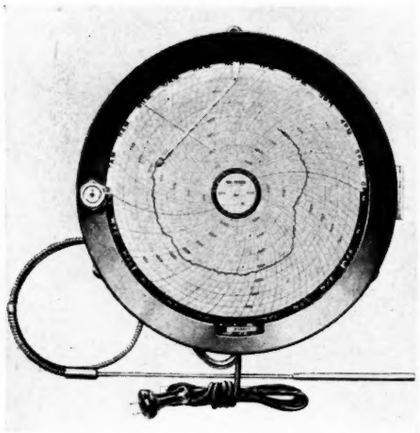
New Equipment

A fan blows a large volume of air across electric heating coils, and discharges it through an attractive grille, circulating it to all parts of the room. The heater is finished in lustrous black with chrome-plated trim, and is equipped with cord and soft rubber attachment plug. It operates on 100-120 volts, 60-cycle alternating current.

Brown Announces Improved Gauges, Thermometers

A revised and improved line of circular chart indicating and recording instruments including thermometers for temperatures ranging from —40° to 1200°, and pressure and vacuum gauges for ranges from 10 in. of water up to 5000 lb. per sq. in., has been announced by The Brown Instrument Co., Philadelphia. All types are available in one, two, or three-pen models.

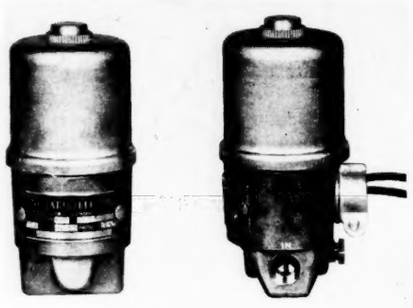
Three different types of actuating element are employed in the pressure and vacuum gauges. For pressures of from 10 in. of water to 30 lb., a flexible metal diaphragm is used; for pressures from 30 lb. to 200 lb., a spring-opposed bellows operates the pen movement, and for higher pressures, a helix is used. The thermometer-actuating movement utilizes a mercury filled Bourdon tube, of stainless steel designed to withstand 100% overload. An electric clock or a hand-wound clock for use in localities where alternating current is not available, is furnished as standard equipment. Cases are of diecast aluminum, interchangeable for rear or bottom connection or for flush-panel mounting. The chart is pressed on the hub without a nut, and clips carried on the door hold it in place.



Brown recording thermometer

G. E. Announces Normally-Closed Solenoid Valve

General Electric Co., Schenectady, N. Y., has announced the CR9507-C1B solenoid valve, designed to meet the requirements for a compact and inexpensive automatic control for the flow of water, gas, oil, and low-pressure steam. It can be used in connection with humidifiers, unit heaters, and for the control of gas or oil-fired heating equipment, etc.



G-E solenoid valve

Valve body is hot-pressed from brass in one piece. There is no joint between the core tube and the coil housing since the stainless iron core and bronze shut-off rod are contained within a copper alloy tube soldered to the valve body.

The valve is of the unbalanced normally-closed type. When the circuit is made the coil is energized, drawing the core upward in the tube opening the valve seat against the downward pressure of the fluid in the line. The valve remains open as long as the coil is energized, and when the circuit is broken, the valve is closed by the pressure in the line augmented by the force of gravity. In opening, the core travels a short distance before striking the upper shoulder of the rod, allowing it to accelerate unloaded to provide a snap action opening.

Reed Rotary Flame burner

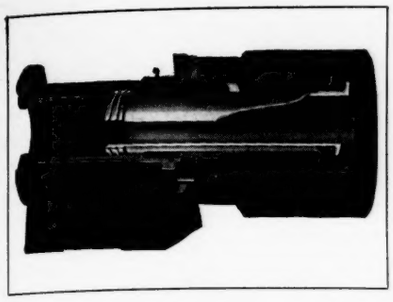
Small Gravity Feed Oil Burner Announced

Charles E. Reed & Co., 3227 Carroll Ave., Chicago, is marketing the Rotary Flame oil burner of the gravity feed, forced draft type for heating small residences, hot water supply, and for small high-pressure boilers.

Combustion takes place with a flat rotating flame, and air is supplied by a small fan directly driven by a 1/100-hp. motor. Fan and motor are totally enclosed in a cast housing with air inlet and adjustment so arranged that incoming air flows around the motor to cool it. Fan and motor comprise the only moving parts of the burner. Burner output is regulated by a high-low flame arrangement, one quart of No. 1 oil being consumed in approximately 6 hr. of low-fire operation. The burner uses up to 1½ gal. of fuel per hour at high flame. The unit is finished in black enamel, and standard equipment includes automatic controls.

Armco Offers Stainless Steel Sheets

Stainless steel plates, strips, and sheets, finding application in the manufacture of furnace and oil burner parts, are being produced by The American Rolling Mill Co., Middletown, Ohio. The manufacturer states that this material has demonstrated unusual ductility and formability when die-worked. Extensive stocks in all sizes and gauges have been built up, and the company is prepared to serve the trade immediately.



Adsco piston ring expansion joint

Piston Ring Expansion Joint Can be Repacked in Service

An expansion joint utilizing piston rings similar to those in reciprocating engines, permitting repacking of the stuffing box while the line is operating under full pressure, has been developed by the American District Steam Co., North Tonawanda, N. Y. The joints are available in all standard pipe sizes and for all operating pressures.

This arrangement of sliding rings throttles the pressure in the steam or other fluid in the line before it reaches the stuffing box. A small relief connection with suitable valve is made into the body of the joint between the piston ring head and the stuffing box so that the pressure that builds up in that area can be quickly relieved when the repacking operation becomes necessary. The rings prevent escape of steam from the line during the packing operation.

A guide head in which the rings are retained serves as an internal guide operating in the machined cylinder of the body, preventing lateral distortion of the slip. A stop ring prevents the slip from pulling out of the body.

Gas Welding Regulators Maintain Constant Pressure

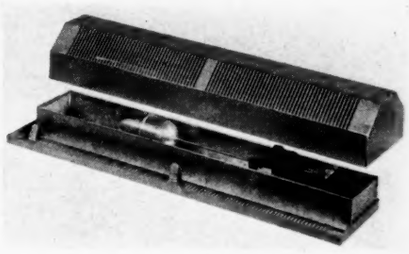
Air Reduction Sales Co., 60 East 42nd St., New York, has announced a new Airco two-stage reduction oxygen regulator, and acetylene regulator. The manufacturer claims unusually close regulating characteristics for this equipment, and states that readjustment to compensate for drop in cylinder pressure is unnecessary. Design of stages, including large seat displacement and a proper proportion of diaphragms and valve openings, eliminates the usual cold weather fluctuations, according to the manufacturer.

These regulators are fully described in a leaflet obtainable from the company.

Humidifier for Radiator Systems

An automatic humidifier for use with direct or concealed radiator heating systems has been announced by Bon-Air Radiator Corp., 99 State St., Boston, Mass.

Unit is made to fit the top of any cast-iron radiator or to attach in the recess of a concealed radiator,



Alpha automatic humidifier

where the warmed air is guided over the surface of the water contained in the reservoir. The slotted cover delivers the air into the room away from the walls and hangings. Water is supplied to the reservoir from the house service through a float-operated valve. It is finished in either chrome or bronze. This humidifier can also be installed in the bonnet of a warm-air furnace.

Furnace Fan Automatically Controls Draft

Miles Furnace Fan Div., The Henry Furnace & Foundry Co., 3471 East 49th St., Cleveland, is manufacturing the Miles controlled forced draft unit in several sizes for residential and commercial heating plants. This device effects an instant and minute control of the air volume and static pressure in response to the predetermined steam pressure or water temperature.

This control is effected by a pivoted shut-off damper at the fan discharge, which yields to the air pressure from the fan to an open position, and yields also to a pressure regulated by the steam or water temperature to a closed position. These counteracting pressures adjust the damper to the exact position which controls the air volume and pressure under the grates.

Self-Tapping Screws with Standard Threads

Kellogg Switchboard & Supply Co., 1066 West Adams St., Chicago, announces the Tapster self-tapping screw with standard thread for assembling sheet steel, machinery steel, brass, aluminum, fiber, slate, bakelite, and similar hard materials. This screw has a hardened steel cutting tip having twin cutting edges, and accomplishes a tapping operation as it is driven, cutting a thread to exactly match its own thread.

Can Type Motors for Small Equipment

Can type polyphase motors in a range of capacities suitable for small heating and air conditioning applications, have been placed on the market by The Ohio Electric Mfg. Co., 5900 Maurice Ave., Cleveland.

Rotor is of the squirrel cage type, and is generally bored with keyway to suit the specifications of the equipment manufacturer installing the motors. The operating spindle of the machine in which the motor is to be used customarily forms the motor shaft. The stators are turned

Ohio Electric can type motors

to the required size and fitted with bakelite end pieces and oil-resisting insulation. Capacities range from ⅜ hp. to 2 hp., and motors are made for various speeds for 60, 50, and 25 cycle power at voltages from 110 to 550.

Light Portable Cutting Machine

A portable cutting machine weighing but 43 lb. has been announced by the Linde Air Products Co., 30 East 42nd St., New York, as an addition to its Oxweld line of gas welding and cutting apparatus. The equipment is known as the Secator, and combines the portability of the blowpipe with the accuracy of a cutting machine. It is equally adaptable for work in the field and in the shop.

Essentially, the Secator consists of an Oxweld blowpipe mounted on an electrically-driven, air-cooled, dustproof chassis. It is provided with an angle-iron track for straight line cuts, and is easily hand-guided for simple shapes. Center and radius rod are furnished for cutting circles.

Thermostatic Valve Regulates Temperature of Hot Water Supply

Lawler Automatic Controls, Inc., 50 Putnam St., Mount Vernon, N. Y., has introduced the Lawler three-way thermostatic tempering valve for controlling the temperature of hot water supplied from submerged heater coils, storage tanks, etc.

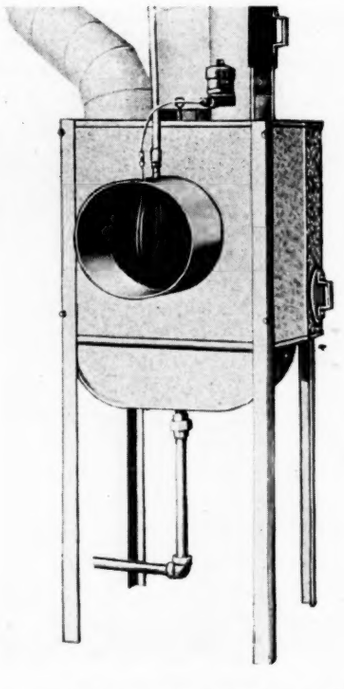
Cold water from the house service, in addition to hot water from the coil or tank, is supplied to the valve, and a sensitive thermostat, located in the mixing chamber, regulates the proportion of cold to hot water delivered to the faucets to maintain the desired temperature. The thermostat, entirely constructed of brass and copper, is of the solid-filled liquid-expanding type. The standard valve is designed to deliver water at a minimum temperature of 140°, and delivery temperature is readily adjusted by turning an adjustment stem at the bottom of the valve.

Fuel Costs Rapidly Calculated on Nomographic Charts

Fuel Engineering Company of New York, 116 East 18th St., New York, is publishing nomographic charts for rapid calculation of fuel values and costs. The charts, known as Fuel Valuegraphs, are arranged in pads for convenient use. Among the operations that can be performed on the charts are: comparison of relative fuel values; calculation of effect of a change in efficiency; comparisons of steam costs with various fuels, efficiencies, etc., and comparison of coal and oil fuels for a given application.

Economizer-Type Humidifier

King Ventilating Co., Owatonna, Minn., is marketing the SunAire, a conditioning unit of the economizer type for residential use. The unit utilizes waste heat from the flue gases in the smokepipe of the heating plant to warm the air in the living quarters and evaporate moisture into it.



SunAire humidifying unit

The unit is connected into the smokepipe between the heater and the chimney, and the hot gases are passed over a U-shaped tube through which air from the rooms above are circulated by gravity. Tap water is warmed in a copper tube placed in the path of the hot gases, and this water is sprayed into the circulated air at the intake, washing and humidifying it. The air is further warmed as it traverses the outlet section before being discharged back into the rooms above. The unit is constructed entirely of copper to resist corrosion. It is stated by the manufacturer that the conditioner will maintain a relative humidity of from 45% to 50% in the home throughout the winter.

Excess water, not evaporated, together with dust and dirt removed from the air, is passed out through a drain located in the bottom of the tube. There are no moving parts.

Forced-Air Units

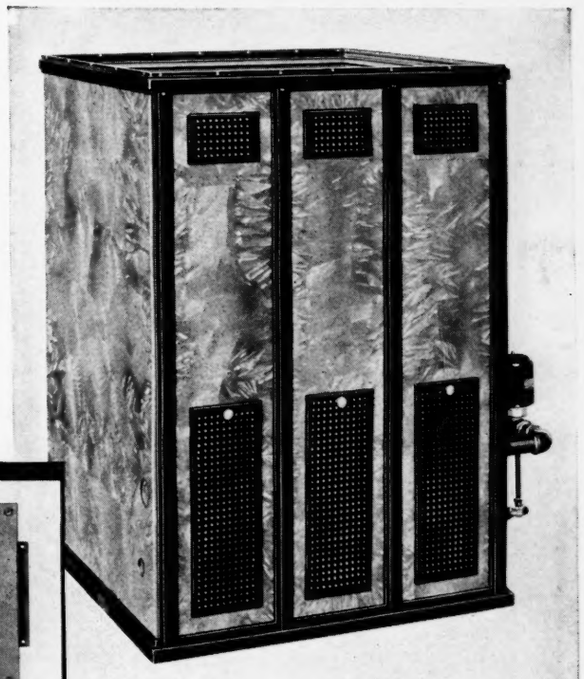
Air Controls, Inc., Div. of The Cleveland Heater Co., 1960 West 114th St., Cleveland, Ohio, has announced a line of Air Packages, complete units for converting gravity warm-air heating systems into forced-air circulating systems. These units are made in the fan type and the blower type.

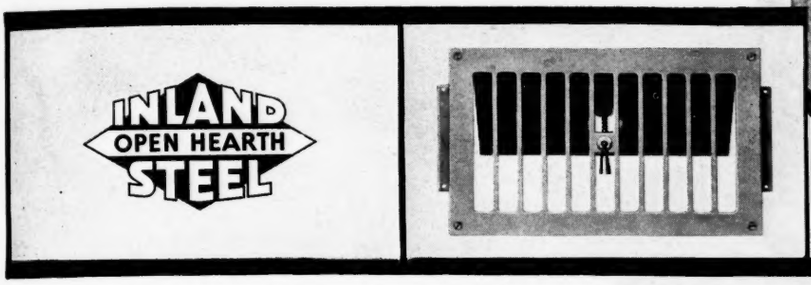
Equipment consists of a quiet, low-speed, motor-driven fan or blower, mounted entirely within an attractive casing, fitted with a boot designed for attachment to the furnace casing. Dustop filters, products of Owens-Illinois Glass Co., Toledo Ohio, are installed for air cleaning. Filters are of oversize capacity, making by-passing unnecessary when gravity operation is used. Automatic louvers permit gravity flow when the fan is stopped. Access to the interior is obtained through removable panels.

Air Package units are available in capacities up to 345,000 B.t.u. delivery per hour. The manufacturer claims unusually quiet operation for these units along with sufficient power to overcome the resistance of air conditioning equipment.

For Air Conditioning Equipment

...also... Inland Steel Is Selected





MANY important heating, ventilating, and air conditioning installations—important for size, for the advances they mark—are of Inland Steel. And many of the leading individual units of equipment making up these installations are of Inland Steel. For the quality, the wide selection of characteristics to meet any requirement exactly, makes Inland Steel the logical source of supply for manufacturer and for contractor alike.

In equipment, raw materials, and experience Inland is "Able..." The more difficult the requirement, the more valuable Inland equipment, control of raw material quality, and experience can be to you. INLAND STEEL COMPANY, 38 S. Dearborn St., Chicago, Ill.

Produced of Inland Steel by the L. J. Mueller Furnace Company, Milwaukee. *At top:* Gas Era furnace. *At left:* Climator register. *Below:* Climator fan, air washer and filter, adapted for addition of refrigeration unit when desired.

NRA MEMBER U.S. WE DO OUR PART

INLAND STEEL

ABLE SERVANT OF THE CENTRAL WEST

Sheets Strip Tin Plate Plates Structurals Piling Rails Bars Track Accessories Rivets Billets

Degree-Days and Unit Fuel Consumption—September, 1933

THIS month HEATING AND VENTILATING begins its sixth year of publishing monthly degree-day data for various large cities in the United States. When begun, these data covered but five cities. The following year data were extended to include nine cities, and from time to time since, the number of cities has been increased until last year 24 cities were covered.

Starting with this issue, the service has been extended to cover 48 cities, and, continuing the policy started last season, not only the monthly degree-day data will be published, but also a comparison with the corresponding month of the year before and with normal for that month, as well as unit fuel consumptions for coal, oil and gas.

	Atlanta	Baltimore	Birmingham	Boston	Buffalo	Chicago	Cincinnati	Cleveland
Degree-days for Sept., 1933.....	—	8	—	55	91	39	8	38
Degree-days for Sept., 1932.....	14	19	—	73	116	85	56	65
Degree-days for Sept., Normal.....	—	—	—	48	75	3	—	27
Lb. coal per sq. ft. rad., Sept., 1933.....	—	0.064	—	0.440	0.728	0.312	0.064	0.304
Gal. oil per sq. ft. rad., Sept., 1933.....	—	0.005	—	0.038	0.062	0.027	0.005	0.026
Cu. ft. gas per sq. ft. rad., Sept., 1933..	—	0.77	—	5.28	8.74	3.74	0.77	3.65

	Davenport	Dayton	Denver	Des Moines	Detroit	Duluth	Fort Wayne	Grand Rapids
Degree-days for Sept., 1933.....	33	21	50	47	63	170	50	64
Degree-days for Sept., 1932.....	71	61	96	87	83	255	104	115
Degree-days for Sept., Normal.....	—	—	72	—	42	261	—	57
Lb. coal per sq. ft. rad., Sept., 1933.....	0.264	0.168	0.400	0.376	0.504	1.360	0.400	0.512
Gal. oil per sq. ft. rad., Sept., 1933.....	0.023	0.014	0.034	0.032	0.043	0.117	0.034	0.044
Cu. ft. gas per sq. ft. rad., Sept., 1933..	3.17	2.02	4.80	4.51	6.05	16.32	4.80	6.14

	Harrisburg	Hartford	Indianapolis	Kansas City	La Crosse	Los Angeles	Louisville	Memphis
Degree-days for Sept., 1933.....	41	70	7	13	86	35	1	—
Degree-days for Sept., 1932.....	48	101	62	31	192	—	27	4
Degree-days for Sept., Normal.....	—	48	—	—	96	—	—	—
Lb. coal per sq. ft. rad., Sept., 1933.....	0.328	0.560	0.056	0.104	0.688	0.280	0.008	—
Gal. oil per sq. ft. rad., Sept., 1933.....	0.028	0.048	0.005	0.009	0.059	0.024	0.001	—
Cu. ft. gas per sq. ft. rad., Sept., 1933..	3.94	6.72	0.67	1.25	8.26	3.36	0.10	—

	Milwaukee	Minneapolis	New Haven	New Orleans	New York	Omaha	Peoria	Philadelphia
Degree-days for Sept., 1933.....	43	60	51	—	31	43	21	19
Degree-days for Sept., 1932.....	99	137	86	—	48	65	93	24
Degree-days for Sept., Normal.....	84	93	39	—	—	—	3	—
Lb. coal per sq. ft. rad., Sept., 1933.....	0.344	0.480	0.408	—	0.248	0.344	0.168	0.152
Gal. oil per sq. ft. rad., Sept., 1933.....	0.029	0.041	0.035	—	0.021	0.029	0.014	0.013
Cu. ft. gas per sq. ft. rad., Sept., 1933..	4.13	5.76	4.90	—	2.98	4.13	2.02	1.82

	Pittsburgh	Portland, Ore.	Providence	Reading	Rochester	St. Louis	Salt Lake City	San Francisco
Degree-days for Sept., 1933.....	20	167	66	44	96	1	46	122
Degree-days for Sept., 1932.....	72	60	91	55	133	23	30	102
Degree-days for Sept., Normal.....	—	105	63	—	72	—	18	114
Lb. coal per sq. ft. rad., Sept., 1933.....	0.160	1.336	0.528	0.352	0.768	0.008	0.368	0.976
Gal. oil per sq. ft. rad., Sept., 1933.....	0.014	0.115	0.045	0.030	0.066	0.001	0.032	0.084
Cu. ft. gas per sq. ft. rad., Sept., 1933..	1.92	16.03	6.34	4.22	9.22	0.10	4.42	11.71

	Scranton	Seattle	Spokane	Syracuse	Toledo	Trenton	Washington, D. C.	Wichita
Degree-days for Sept., 1933.....	95	222	252	93	51	31	10	9
Degree-days for Sept., 1932.....	126	142	146	131	99	51	26	21
Degree-days for Sept., Normal.....	60	192	192	96	9	—	—	—
Lb. coal per sq. ft. rad., Sept., 1933.....	0.760	1.776	2.016	0.744	0.408	0.248	0.080	0.072
Gal. oil per sq. ft. rad., Sept., 1933.....	0.065	0.152	0.173	0.064	0 035	0.021	0.007	0.006
Cu. ft. gas per sq. ft. rad., Sept., 1933..	9.12	21.31	24.19	8.93	4.90	2.98	0.96	0.86

Fuel consumption figures given above are based on certain conditions, and for other conditions corrections must be made. The figures assume the use of steam radiators emitting 240 B.t.u. per sq. ft. per hr., a system operating at 100% efficiency, and radiators calculated for maintaining 70° in zero weather. Heating values assumed for the fuels are 12,000 B.t.u. per lb. for coal, 1000 B.t.u. per cu. ft. for gas, and 140,000 B.t.u. per gal. for oil. To correct for other heating values, efficiencies, and design conditions, follow the method explained in the "Heating and Ventilating Degree-Day Handbook."

MODERNIZE

... with the Barber-Colman ELECTRIC System of TEMPERATURE & HUMIDITY Control ★

INSTALL CONTROLS - Any building which lacks reliable automatic controls on the heating, ventilating, or air conditioning equipment can be made more economical to operate, more habitable, and more attractive to tenants by installing the Barber-Colman *Electric* System of Temperature and Humidity Control. This equipment is all-electric, simple, and sturdy. It can be applied easily to any type of heating, ventilating, or air conditioning installation in any type of building.

SELF-AMORTIZING - In the majority of existing buildings it is possible to so sectionalize the controls that a satisfactory system can be provided which will pay for itself, in fuel savings alone, in one to three years. A *complete* Barber-Colman system controlling all rooms individually will pay for itself, in the same way, in two to three times as long.

★ *The* BARBER-COLMAN *Electric System of* TEMPERATURE *and* HUMIDITY CONTROL

Electric Thermostats
Motor-Operated Valves
Damper Controllers
All Necessary Accessories

USER SATISFACTION - The reliability, efficiency, and economy of the Barber-Colman *Electric* System of Temperature and Humidity Control is demonstrated by successful operation over a period of years in a wide variety of commercial installations. Here is what some users say:

OFFICE BUILDING MANAGER:—"This building is an old one with a rather antiquated heating system...People on one floor complained how cold it was while...on another floor...it was too hot...Barber-Colman system immediately eliminated this situation...has saved us considerable money during each heating season."

FACTORY MANAGER:—"The control is dependable and gives greater comfort to the men, as well as making for economy in steam."

CITY MANAGER:—"The temperature control system has resulted in our being able to maintain a uniform temperature throughout the building, add an additional garage structure to our heating capacity, almost equal to the City Hall itself, and heat the entire property in a most satisfactory manner with less fuel than was formerly used in heating the City Hall alone."

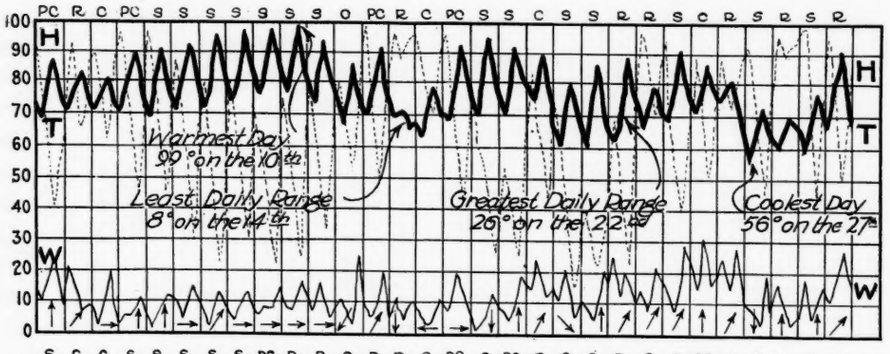
INVESTIGATE! - Write for a copy of our new Bulletin B-3. Let our engineers work with you. Modernize...with the Barber-Colman *Electric* System of Temperature and Humidity Control.

BARBER-COLMAN COMPANY

ROCKFORD, ILLINOIS

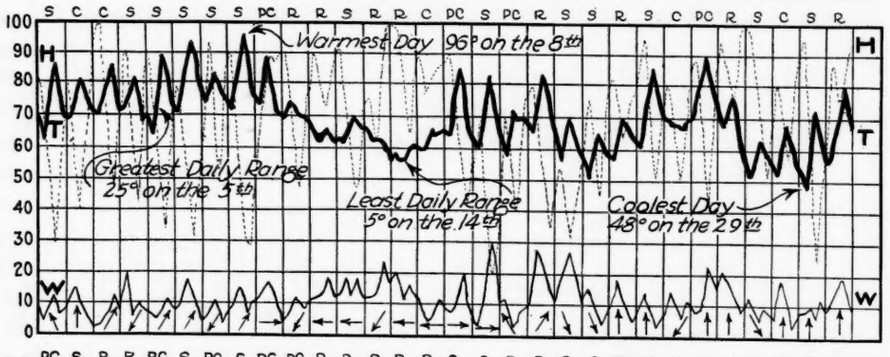
THE WEATHER FOR SEPTEMBER, 1933

Plotted from records especially compiled for HEATING AND VENTILATING by the U. S. Weather Bureau. Heavy curves (T), temperatures in deg. F.; dotted lines (H), per cent relative humidity, from readings at 8 a.m., noon, and 8 p.m., except for New York, which shows hourly readings. Light lines (W), wind velocity in m.p.h. Arrows indicate prevailing wind directions. S—clear; PC—partly cloudy; C—cloudy; R—rain; Sn—snow.



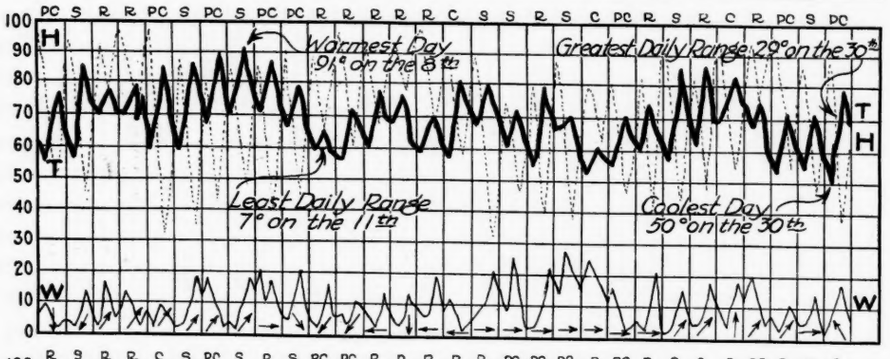
St. Louis

Mean temp. for month, 77.4°; aver. wind velocity, 10.5 m.p.h.; prevailing direction of wind, S.



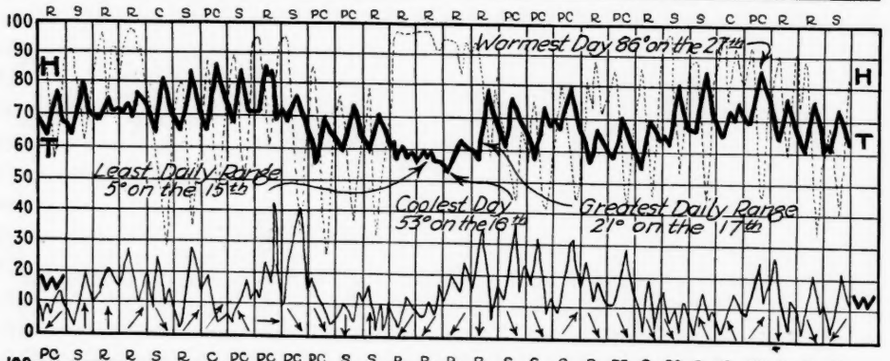
Chicago

Mean temp. for month, 69.8°; aver. wind velocity, 10.1 m.p.h.; prevailing direction of wind, S.



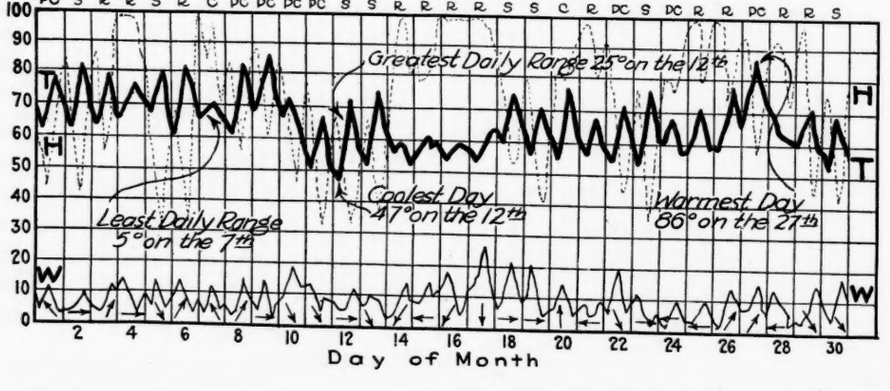
Pittsburgh

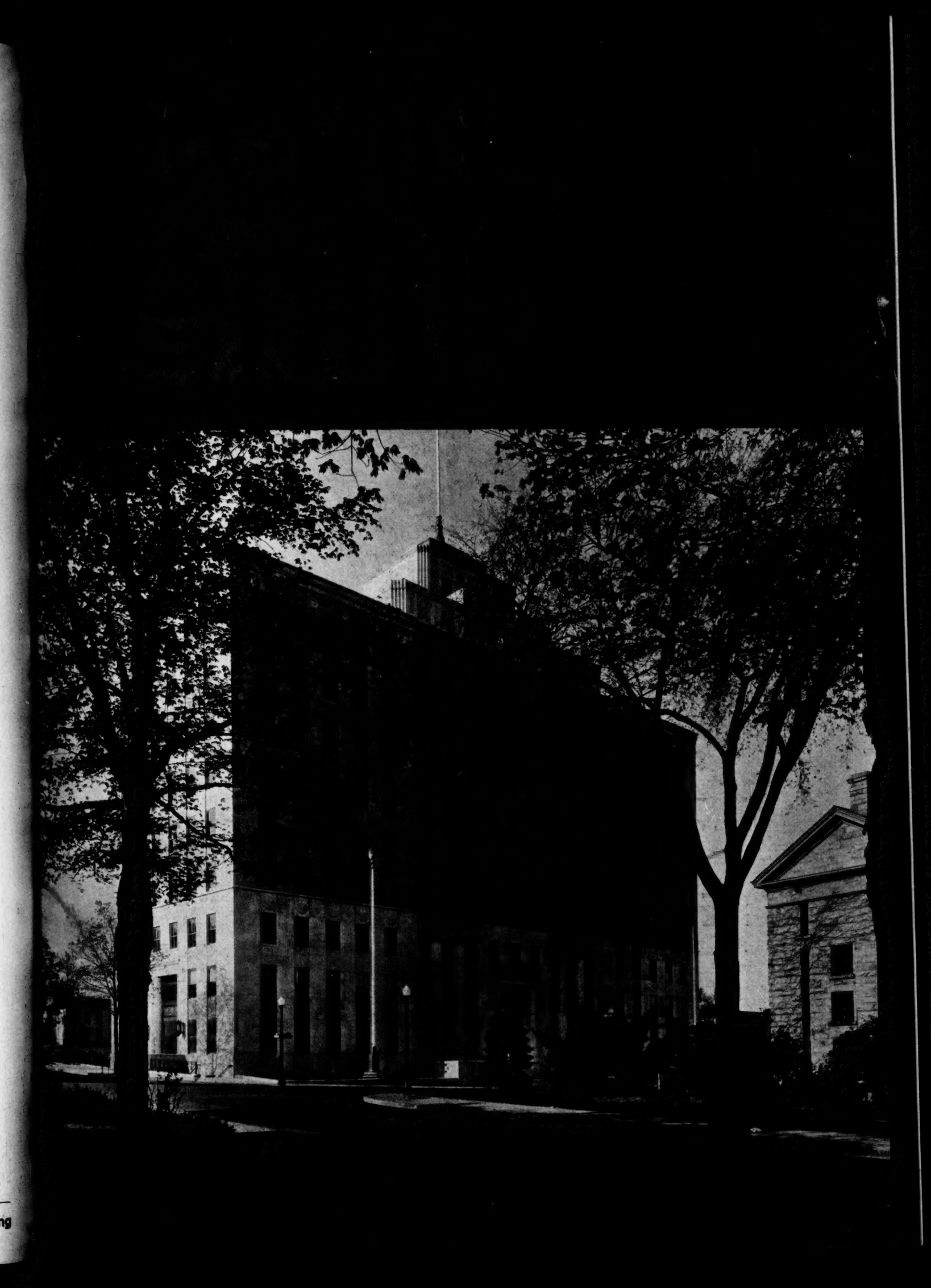
Mean temp. for month, 69.0°; aver. wind velocity, 8.7 m.p.h.; prevailing direction of wind, S.W.



New York

Mean temp. for month, 68.8°; aver. wind velocity, 12.8 m.p.h.; prevailing direction of wind, N.W.


Greatest Daily Range 25° on the 12th
Least Daily Range 5° on the 7th
Coolest Day 47° on the 12th
Warmest Day 86° on the 27th
2 4 6 8 10 12 14 16 18 20 22 24 26 28 30
Day of Month

Boston

Mean temp. for month, 65.8°; aver. wind velocity, 8.2 m.p.h.; prevailing direction of wind, W.